NEW BAKER "Yardloader"
TRADE-MARK

4000 LB. GAS FORK TRUCK COSTS ONLY $2985.00

Priced about 25% under any other gas trucks in its capacity, the Yardloader now brings cost-saving fork truck operation within the reach of practically every company with yard-handling problems. Travel speed approaching 14 miles per hour, large pneumatic tires, exceptionally high ground clearance and oscillating trail axle make it the ideal truck for outdoor service over large unimproved or semi-improved areas.

Heavy-duty industrial engine of proven make, 4-speed transmission and extra-heavy drive axle assure ample power for top performance under any conditions. Hydraulic lift to 122 inches, automotive-type steer, convenient controls and excellent driver visibility are a few of the features contributing to safety and ease of operation.

Get all the facts—and save up to $1000.00 on your next gas fork truck.

Send in this coupon today.

THE BAKER-RAULANG COMPANY

1251 West 80th Street • Cleveland 2, Ohio

The Baker-Lull Corporation • Subsidiary, Minneapolis, Minn.
Materials Handling and Construction Equipment

TO THE BAKER-RAULANG CO., 1251 West 80th St., Cleveland 2, Ohio

Please send me information and specifications on the new Baker EY-40 Yardloader which sells for only $2985.00.

*Name*_____ *Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Plant Engineers Move Up

Raymond C. Hearon was recently named plant engineer at the Hercules Powder Company's Burlington, New Jersey, plant, replacing Barrett H. Champion who has been named to the engineering staff at the Hercules' home office in Wilmington, Delaware. Before receiving his present appointment, Mr. Hearon was assistant plant engineer at the Hattiesburg, Mississippi, plant.

Ralph E. Fritzsche was appointed plant engineer for the Clark Controller Co., Cleveland, Ohio. As plant engineer, he will be responsible for maintenance, custodial service, plant layout and engineering.

Donald T. Eyberg is the new plant layout supervisor for Minneapolis-Honeywell Regulator Co., Minneapolis, Minnesota. He will take over the duties formerly handled by Jack Levin, who is no longer with the company.

Dave Wooster was appointed works engineer of Basic Refractories, Inc., Gabbs, Nevada, plant. As works engineer, he will have charge of maintenance over the quarry, crusher and burning plant operations and will supervise engineering of maintenance and construction of new facilities.

Master Mechanic Promoted

Carl Gustafson was recently appointed director of mechanical maintenance for the Colorado Fuel and Iron Corp. He will advise on mechanical problems arising in all of the company's 14 plants. In addition, he will continue to be superintendent of the mechanical department at the Pueblo, Colorado, plant.

In 1948, Mr. Gustafson was named master mechanic at Pueblo, after serving for five years as assistant master mechanic.

Morris New Sec.-Treas. of SBME

Richard H. Morris, Editorial Director of PLANT ENGINEERING, was elected Secretary-Treasurer of the Society of Business Magazine Editors for 1954. At the same meeting Frank P. Tighe, Editor of *Motor Age* was elected second

(Continued on page 4)

New Officers for Plant Engineers' Clubs

Kentuckiana—The Kentuckiana Plant Engineers' Society recently elected its officers for the coming year. **C. C. Bassett,** of Belknap Hardware & Mfg. Co., was elected president; **J. S. Case,** of Tube Turns, Inc., will be vice president; and **M. F. Reich,** of P. Lorillard Co., is secretary-treasurer. The Members-at-Large will be: **J. H. Murrell,** of Ford Motor Co., and **E. R. Lott,** of Buckeye Cotton Oil Co.

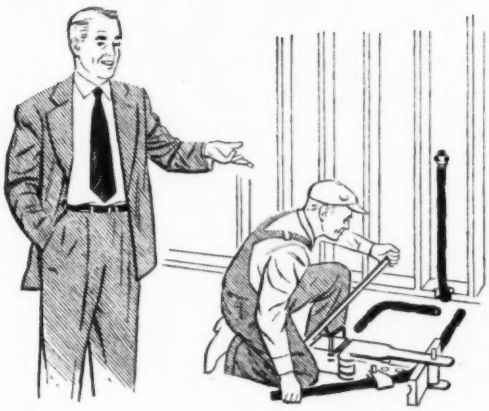
Northern Illinois — Officers of the Plant Engineers' Society of Northern Illinois for 1954 will be: **W. D. Nelms, Sr.,** Abbott Laboratories, president; **J. Church,** Fansteel Metallurgical Corp., vice president; **L. Puzin,** Chicago Hardware Foundry Co., secretary-treasurer. The Directors for the coming year will be: **R. F. McShane,** Public Service, and **R. J. Gordon,** Greiss-Pfleger Tanning Co.

Officers for the Plant Engineers' Society of Northern Illinois for the coming year, from left to right, are: L. Puzin, R. F. McShane, S. A. Simonson (outgoing president), W. D. Nelms, Sr. (New President), R. J. Gordon and J. Church

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

The LONGER LIFE of WROUGHT IRON PIPE

proves...



It costs less to do it right

—than to do it over!

When you specify pipe there are two things well worth remembering—

1. When you install it, you pay only the pipe fitter,

but

2. Every time you repair it, you pay pipe fitter, carpenter, mason, plasterer, and painter.

This dollars-and-cents difference underscores the fallacy that low-first-cost materials are the answer to piping economy. And these same facts provide a yardstick that places the economy emphasis where it rightly belongs . . . on PIPE SERVICE LIFE. The longer service life of wrought iron pipe has proved to thousands of users that it costs less to do it right than to do it over. In installation after installation, wrought iron pipe has doubled, tripled, and even quadrupled the useful life previously obtained from low-first-cost piping. These users have discovered that although you pay a little more for wrought iron, you pay a LOT LESS FOR MAINTENANCE. Wrought iron gives you piping economy because it lasts longer, at lower cost per year.

We'll welcome the opportunity to discuss your particular corrosion problems, and to show you wrought iron durability records in services similar to those in which you are interested. Write or call. Your request will be handled promptly.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Department: New York, N. Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unique fibrous structure of wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glasslike silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

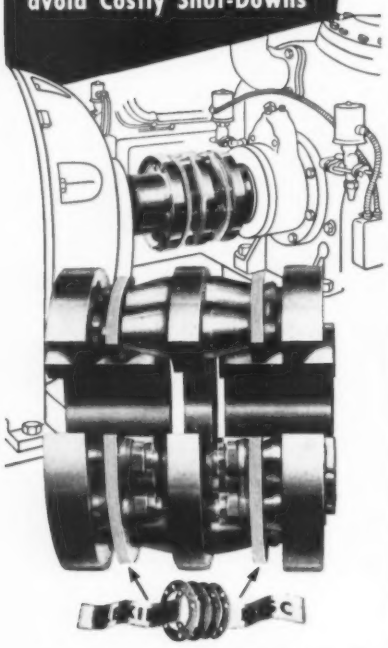
WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

For more facts circle 503 on Reply Card

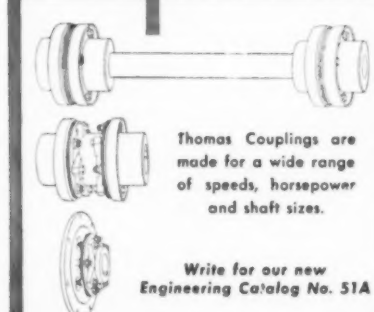
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.
For more facts circle 504 on Reply Card

'ROUND ABOUT

vice president; William A. Richardson, Editor of *Medical Economics*, first vice president; and Walter J. Murphy, Editor of *Chemical & Engineering News*, president.

The SBME is a national professional organization of senior editors of 150 professional and technical magazines with a total circulation of over 2,500,000. Its purpose is to promote high editorial standards and help industrial magazines better serve their respective fields. First president and present secretary of the Executive Committee is Paul Wooton, dean of Washington correspondents. The symbol of the Society, the Circle and Quill, appears near the top of the masthead column.

Sweet's Plant Engineering File

IN ITS SECOND YEAR of distribution by Sweet's Catalog Service, the enlarged 1954 Plant Engineering File will be received by 30,000 plant engineers, plant executives and purchasing officials responsible for the organization, installation, operation and maintenance of all plant facilities and services to production.

With the addition of the new catalogs and the revision of the 1953 catalogs, the plant engineer will have at his elbow the largest single reservoir of up-to-date buying information.

Customer Service School

IN SEPARATE five-day sessions, two groups of customers recently attended the customer service school conducted by Yale Materials Handling Division, The

Instructor H. Lavan points out a feature of a Yale control valve to F. R. Moses, Plant Engineer of Continental Can Company's Milwaukee plant. Mr. Moses is also a member of the Plant Engineers' Society of Milwaukee, Wis.

Yale & Towne Mfg. Co., at its Philadelphia plant.

Customers were trained in preventive maintenance and service of Yale hydraulic gas and diesel trucks, and hydraulic electric trucks. In addition to work with units made available for the course, blackboard talks with cutaway models and many drawings helped the students to reach a thorough understanding of the equipment.

Industrial Ventilation Course

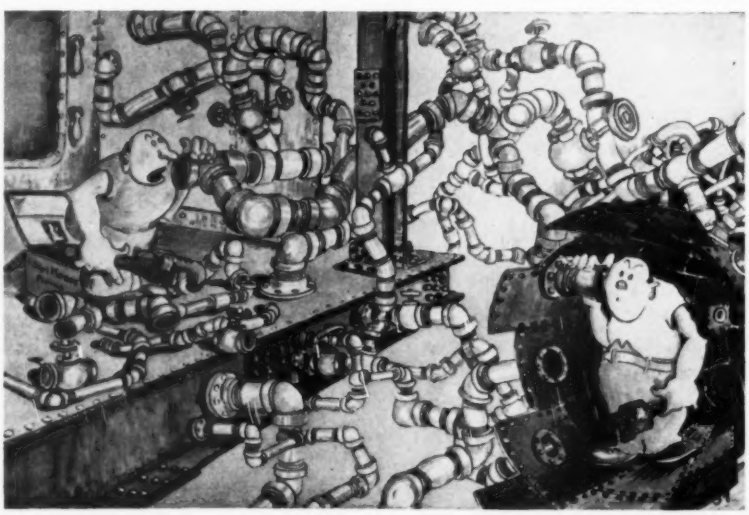
THIRD ANNUAL Industrial Ventilation Conference will be held at the Kellogg Center, Michigan State College, East Lansing, Michigan, from February 22 to 25.

Papers presented the first day will

(Continued on page 196)

Brown Calendar for '54 is Another Rib-Tickler

FOR QUITE A few years people have been enjoying the Bill Eddy cartoons in the Brown calendars, prepared by the Brown Instruments Division of Minneapolis-Honeywell Regulator Co. A typical example of the laugh-provoking illustrations is this October cartoon from the '54 calendar of an unusual piping layout.



"Testing, testing—'What Hath God Wrought?'"

GRINNELL announces its new line of

GAS-FIRED UNIT HEATERS

Available in 7 sizes — with input ratings from 25,000 to 200,000 Btu's.

All parts readily accessible for periodic servicing.

AUTOMATIC! EFFICIENT! ASSURE YEARS OF DEPENDABLE SERVICE

Grinnell gas-fired unit heaters are easy to install, simple to operate and maintain. Efficient performance assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit.

Automatic safety pilot operates to shut off main gas supply if pilot burner goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. Low speed motors have built-in thermal overload protection and automatic reset.

Additional features of Grinnell *gas-fired* unit heaters . . .

- Casing die-formed of heavy steel, with baked-on enamel finish
- Heat exchanger tubes and draft diverter of aluminized steel
- Combustion chamber of heavy steel, welded
- Burners of close-grained iron castings
- Adjustable louvers
- Burners and control assembly removable as a unit
- Hinged bottom pan permits cleaning interior of tubes
- Threaded pipe hangers for easy suspension
- Only wiring required is connection to room thermostat or manual switch
- Approved by the American Gas Association

WRITE FOR CATALOG

GRINNELL
UNIT HEATERS FOR STEAM, HOT WATER, GAS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

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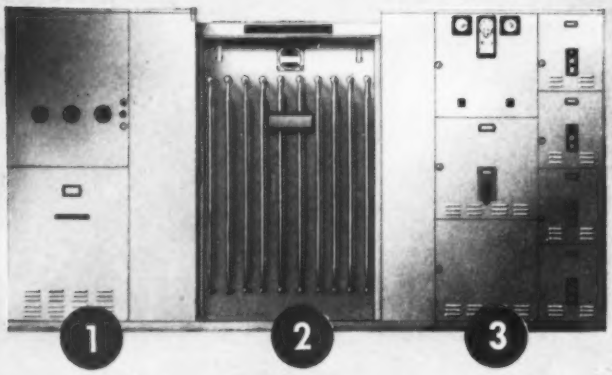


Another reason why General

THEY'RE EQUIPPED WITH

The low-voltage side of General Electric Load-center Substations is protected by Type AK air circuit breakers, which are co-ordinated with the transformer to give adequate protection against the greatest short-circuit current the transformer could possibly deliver. Three new AK breakers, with interrupting ratings from 50,000 to 100,000 amperes, together with AK breakers with interrupting ratings of 15,000 and 25,000 amperes give G-E load-center substations the most advanced line of low-voltage breakers available today. Many new engineering advances assure the superiority of G-E breakers.

DRAWOUT EQUIPMENT is specially designed for use in load-center substations—adds to attractive appearance of equipment. Completely co-ordinated compartments and breakers make the new design smaller and more compact. Standardized compartments provide greater flexibility, permit faster delivery schedules and lower maintenance costs. Structure frame, bus supports, bus and connections of the new equipment have been designed and ***tested to withstand up to 100,000 amps short-circuit current.*** Isolation of both control wiring and terminal blocks within steel troughs also means greater reliability and safety than ever before.

BREAKER-LIFTING DEVICE is available for easy raising and lowering of breakers. The lifting device may be left in position without interfering with the operation of the switchgear.

LOAD-CENTER SUBSTATIONS

Most dependable . . . because they are made from the finest components available.

1 AIR INTERRUPTER SWITCH

Thousands in service, many more than 10 years, with not one *reported electrical failure.*

2 PYRANOL* TRANSFORMERS

Less than one failure per 2500 transformer years.

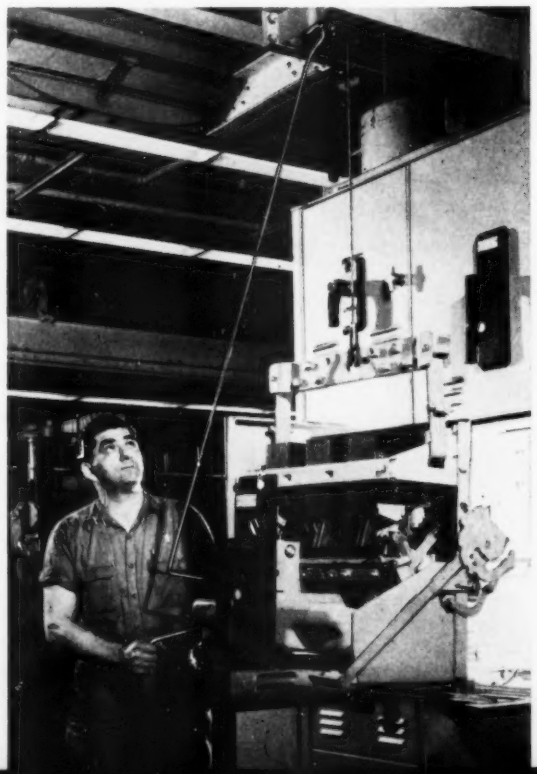
3 NEW LOW VOLTAGE BREAKERS

The safest, most reliable G-E air circuit breaker ever built.

*Reg. Trade-mark of General Electric Co.

BREAKERS ARE EASILY WITHDRAWN from compartments for inspection or maintenance. Racking mechanism is an integral part of the breaker for greater safety and reduced maintenance.

BREAKER-LIFTING DEVICE makes breaker handling easy. The device, operating on a simple windlass principle, can be left in position without interfering with breaker operation.



Electric Load Centers are the most reliable you can buy:

REVOLUTIONARY NEW AIR CIRCUIT BREAKERS

WEATHERPROOF OUTDOOR UNITS protect breakers from the elements. A thirty-inch lighted aisle in front of breakers makes it *possible for the operator to walk the entire length of the line-up with the outer doors closed.* An *aluminum lifting device* mounted in the top of the structure makes breaker handling easy.

STORED-ENERGY CLOSING MECHANISM in new breakers gives safer, positive closing even against fault conditions. Closing is accomplished by energy stored in a sturdy closing spring *even if control power is lost after closing action is initiated.*

SELECTIVE OPERATION *up to full interrupting rating* is now possible because breakers' 30-cycle momentary ratings are equal to full interrupting ratings. In a selective system triple-characteristic tripping devices open the correct breaker to *isolate a fault and keep the rest of the system in operation.*

MULTIPLE CONTACTS give faster arc extinction, longer contact life and reduced maintenance expense *by actually reducing arc energy to be interrupted.* An exclusive linkage in the contact mechanism braces contacts against the stationary pole unit so that short-circuit forces actually help hold the contacts together, instead of tending to force them apart.

INTEGRAL RACKING MECHANISM on new breakers *is on the removable breaker,* rather than on the enclosure. This makes maintenance easier and reduces the possibility of the operator coming in contact with live parts.

READILY ACCESSIBLE CURRENT TRANSFORMERS can be changed without disturbing bus connections.

INTERCHANGEABLE PARTS between new breakers greatly reduce parts stocking problems. The main physical difference between the three new breakers is the number of contact fingers per pole which increases with rating.

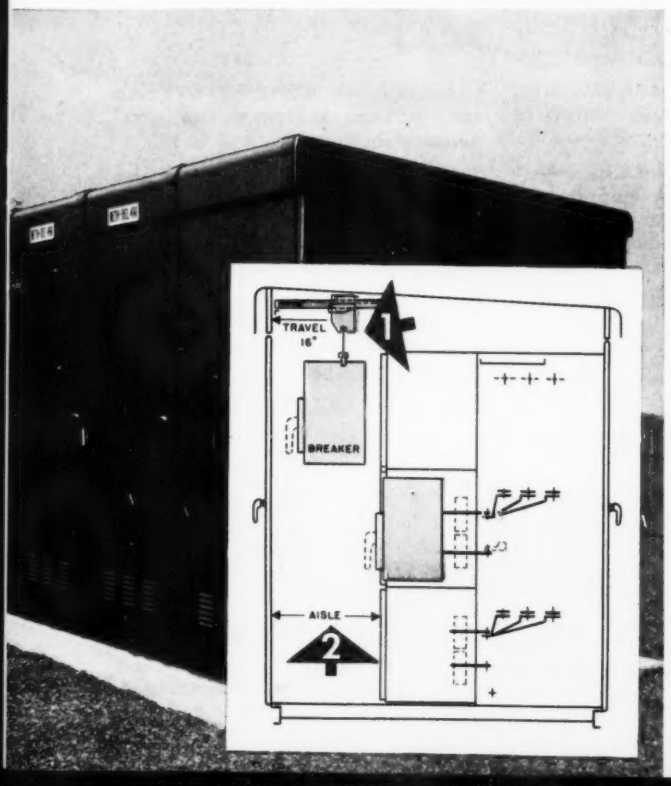
FOR MORE INFORMATION *about General Electric load-center substations, ask your G-E sales representative for bulletin GEA-3592 or write to General Electric Co., Schenectady, N. Y.*

881-5

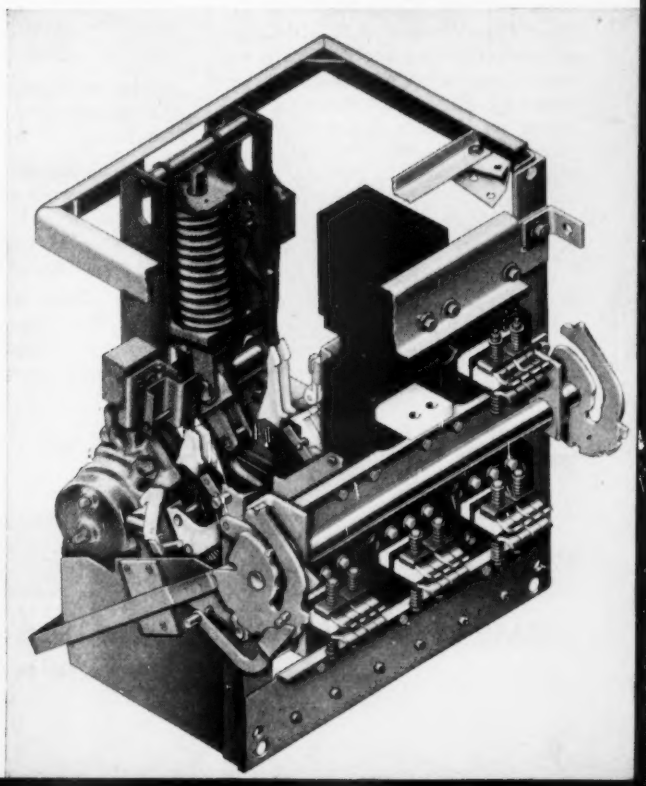
Progress is our most important product

GENERAL ELECTRIC

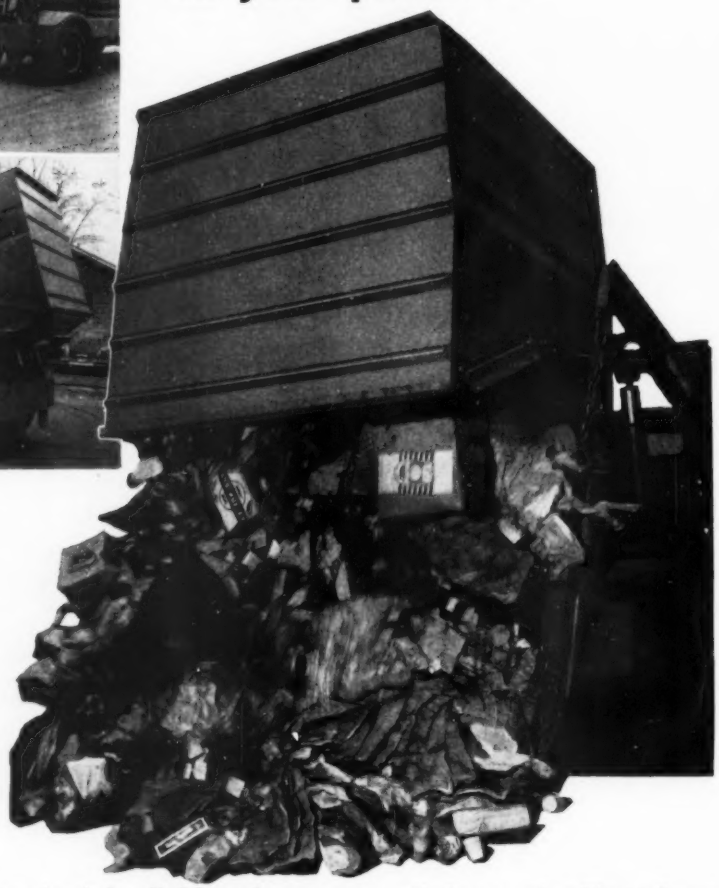
OUTDOOR UNITS are completely weatherproof. Aisle in front of breakers allows operator to walk length of compartment with outer doors closed. Lifting device in top of structure aids in removal of breakers.



STORED-ENERGY CLOSING MECHANISM, shown in color in this cutaway drawing, in new breakers gives safer, positive closing under any conditions with energy stored in closing spring.



Rubbish Disposal is only ONE of the Cost Cutting jobs for the Dempster-Dumpster in your plant...



It's amazing, almost to the point of fantasy; yet so soundly real, what the minds of men in all types of industry have cooked up for more efficiency and reduced costs with the Dempster-Dumpster.

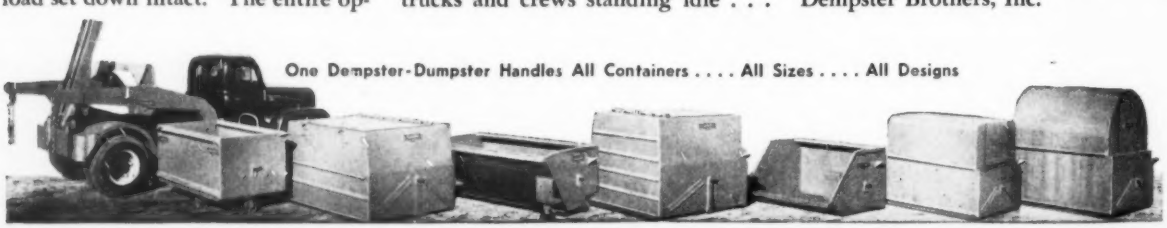
Hundreds of plants are handling materials of practically every description with one truck-mounted Dempster-Dumpster serving scores of detachable containers. Here are just a few. Oils, gases, and liquids handled in our Tank Type Containers . . . tools and equipment in our Tool Shed Type Container . . . containers on casters placed for receiving steel chips from lathes or at conveyors for receiving finished products . . . container with doors and windows, replacing shacks for plant guards or nightwatchmen . . . containers built to handle chlorinator ash residue of approximately 1500° F. and there are dozens more.

Containers are placed wherever material accumulates. When loaded each is picked-up, hauled and emptied (as illustrated above) . . . or load set down intact. The entire operation is handled by only one man, the driver, by hydraulic controls in cab.

The containers are built in capacities up to 12 cu. yds. and each is designed to suit the materials to be handled—be they bulky, light or heavy . . . solids, liquids or dust.

One Dempster-Dumpster, with driver, does the work of 3 to 5 conventional trucks . . . eliminates trucks and crews standing idle . . . eliminates rehandling of materials and increases efficiency and good plantkeeping.

If you have even any remote idea that this equipment could be adapted to your operation, by all means contact us because being without the Dempster-Dumpster System could easily be costing your company thousands of dollars annually. Manufactured and sold exclusively by Dempster Brothers, Inc.



DEMPSTER BROTHERS, 124 SHEA BLDG., KNOXVILLE 17, TENNESSEE

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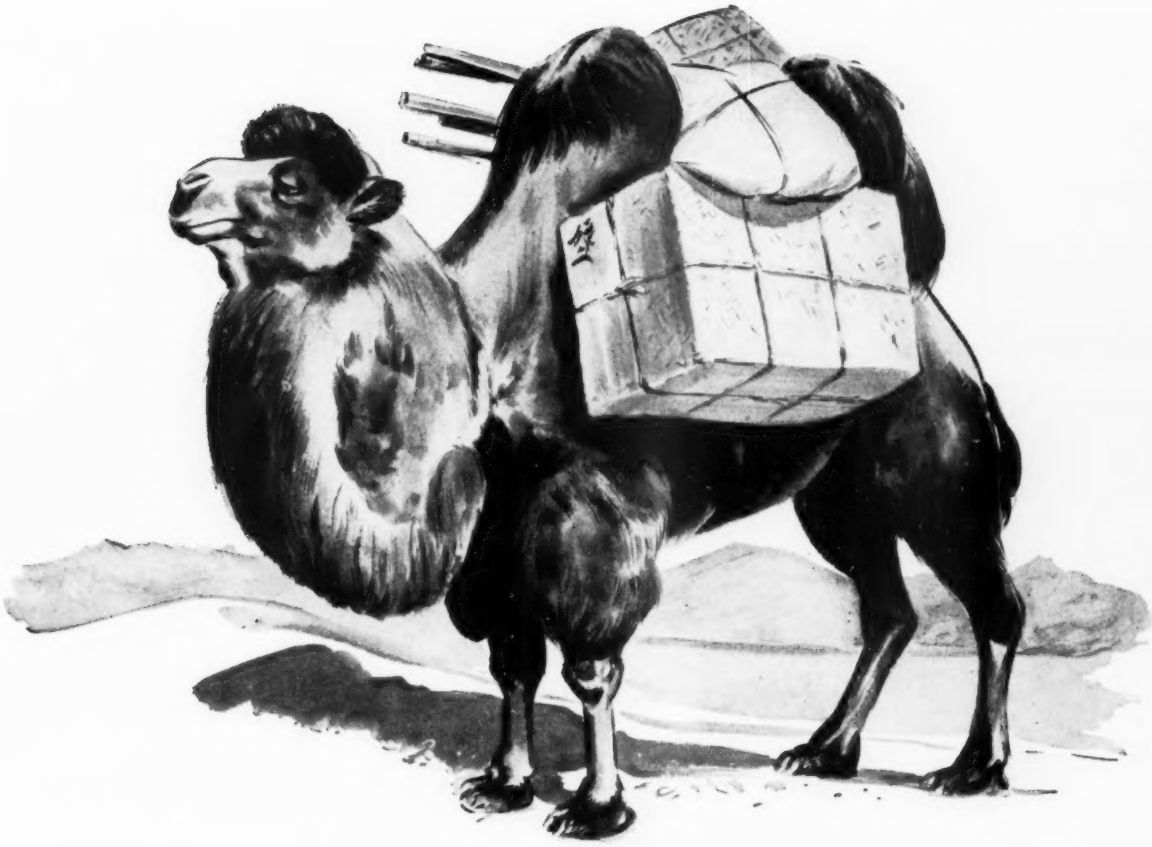
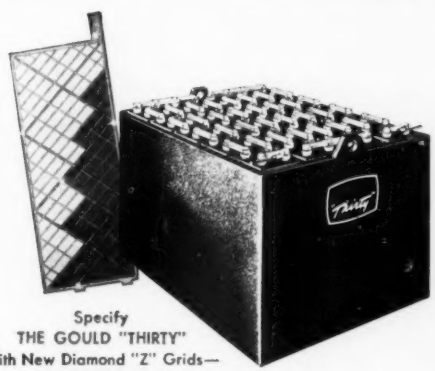


LASTING POWER for Handling . . .

THANKS TO BATTERY POWER!

For the higher lifts and faster maneuvering required in today's handling operations, industrial trucks are a lot more rugged than they used to be. Batteries to power them are more rugged, too. Their increased capacity gives them lasting power to work longer, with greater reliability and at lower cost than with any other type of power. Only with battery power do you get the complete dependability, flexibility and adaptability to meet modern handling needs.
There's *no* power like battery power.
There's *no* battery power like *Gould* power!



Specify
THE GOULD "THIRTY"
with New Diamond "Z" Grids—
America's Finest
Industrial Truck Battery

GOULD *INDUSTRIAL BATTERIES*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

©1953 Gould-National Batteries, Inc.

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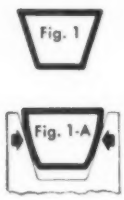
Why V-Belts with CONCAVE SIDES Last Longer!

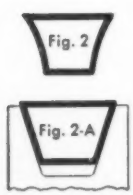
(U.S. PAT. NO. 1813698)

Prove this yourself!



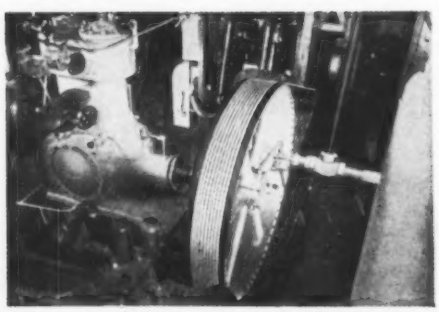
Take any *straight-sided* V-Belt (Fig. 1). Bend it—as it bends in going around a pulley. The sides will at once *bulge out* (Fig. 1-A). Clearly, those bulging sides will press *unevenly* against the V-pulley—and this causes *extra wear* at the points shown by the arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)



Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* to *fit exactly* in the sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the Gates Vulco Rope—and this means *longer* belt life and *lower belt costs* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE Sides—the Gates Vulco Rope!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

Gates VULCO ROPE DRIVES

REG. U. S. PAT. OFF.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

THE GATES RUBBER COMPANY
DENVER, U.S.A.

For more facts circle 509 on Reply Card

The two Westinghouse "G" Air Compressors in the background supply air for four of these hand-held staplers with which lining is fastened inside the luggage.

10 reliable Westinghouse Air Compressors help keep production flow steady

AT BALTIMORE LUGGAGE COMPANY

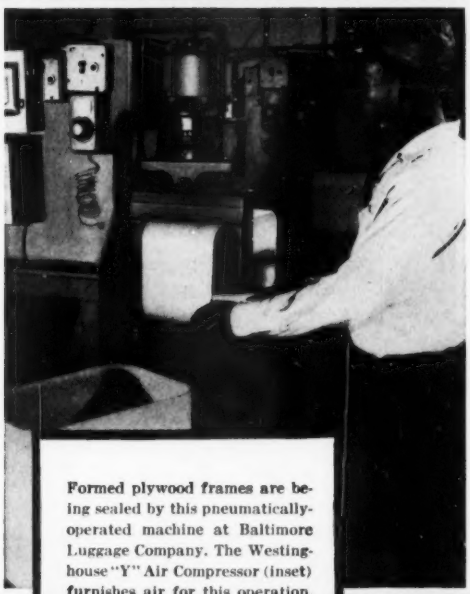
● Baltimore Luggage Company, Baltimore, Md., lets air do the work on many operations in manufacturing its line of ladies luggage. Providing an uninterrupted supply of air to the pneumatically-controlled equipment in the plant are a total of 10 Westinghouse Air Compressors.

To prolong compressor life and assure uninterrupted production during routine maintenance, Baltimore Luggage has assigned twin units to various jobs, operating them on alternate days. For example, two 5 hp Westinghouse "Y" Air Compressors supply air to three plywood bending machines and three plywood sealing machines which form luggage frames. These compressors have been in service three years with little maintenance.

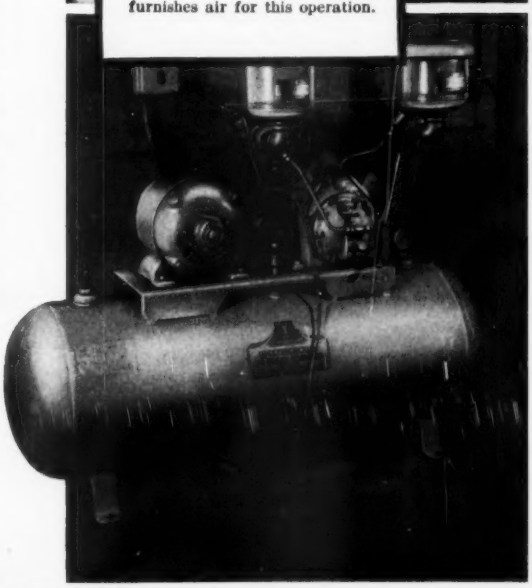
Two 1½ hp Westinghouse "G" Air Compressors furnish air to pneumatically-operated electronic heat sealers, and two ½ hp "G" Compressors supply air for hand-held staplers. They, too, have operated for periods from 1½ to 2½ years with little maintenance.

Wherever you need air in your plant, you need a Westinghouse Air Compressor with such exclusive long-life features as low oil-level protection, controlled pressure lubrication, thermal overload protection and positive starting unloader.

Ask your Westinghouse Air Compressor dealer to show you the model that fits your air requirements. He's listed in the Classified Section of your telephone directory.



Formed plywood frames are being sealed by this pneumatically-operated machine at Baltimore Luggage Company. The Westinghouse "Y" Air Compressor (inset) furnishes air for this operation.



Westinghouse Air Brake
COMPANY

INDUSTRIAL PRODUCTS DIVISION WILMERDING, PENNSYLVANIA

Factory Branch: EMERYVILLE, CALIF. Distributors throughout the United States . . . Consult your Classified Directory. Distributed in Canada by: Canadian Westinghouse Co. Ltd., Hamilton, Ontario

For more facts circle 510 on Reply Card

NEW I-T-E 100-AMPERE "E"

Completely new design in 1-, 2-, and 3-pole construction!

All these I-T-E quality features:

1 ***Thermal-magnetic tripping***
gives complete protection against overloads and short circuits.

2 ***Quick-make, quick-break contact action***
assures long breaker life.

3 ***"Common trip" operating mechanism***
opens all poles simultaneously when there's an overload on any one pole.

4 ***"Trip-free" handle mechanism***
prevents breaker from being closed against faults.

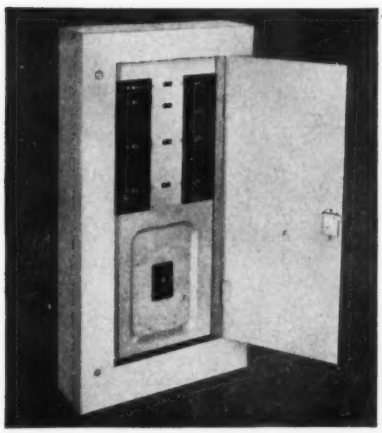
5 ***Three-position handle***
indicates whether breaker is ON, TRIPPED, or OFF.

Available in ratings from—

15 to 100 amperes
1 pole: 125 volts a-c, d-c
2 pole: 250 volts a-c, 125/250 volts d-c
3 pole: 250 volts a-c, 125/250 volts d-c
5,000 amperes interrupting capacity

I-T-E

FRAME CIRCUIT BREAKER



For switchboards, panelboards, power panels

Saves space
through compact over-all design and mounting arrangements.

Simplifies mounting
in switchboards by use of rear connection studs. Easy front removal of breakers. Safe. Saves time.

Provides ample bussing space
to accommodate required copper bus. Enlarged pole spacings designed into breaker case.

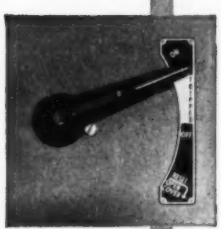
For all types of individual enclosures

New "E" frame design now provides up to 100 amperes capacity for individual enclosure mounting. Breaker is easy to wire. Solderless pressure-type terminals are easily accessible . . . convenient to use.

For fluorescent lighting applications
at 277 volts a-c, single-pole "E" frame breaker provides positive protection.

NEW I-T-E OPERATING HANDLE MECHANISM

allows breaker to be operated from outside steel cabinets and enclosures.



Attractive modern design features molded pistol grip handle.

Position indicator clearly shows when breaker is ON, TRIPPED, or OFF.

Interlock prevents opening door with breaker "on".

Easy installation. Instructions and drilling template supplied with mechanism.

Slam-proof. Shock resistant spring-loaded cam arrangement eliminates handle breakage.

Self-centering design feature automatically engages breaker handle when mechanism is operated.

SAVE TIME, SAVE SPACE... WITHOUT SACRIFICING QUALITY

Standardize on I-T-E circuit breakers to assure service continuity, simplified maintenance, a single source for system expansion and—*always*—the same proved I-T-E dependability throughout.

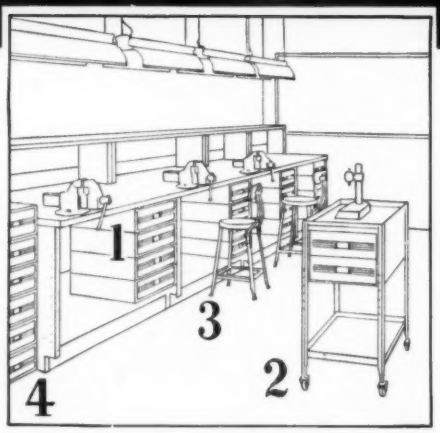
For details, write to *I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.*

Molded Case Circuit Breakers

For more facts circle 511 on Reply Card

MODERNIZING YOUR LAB?
Fit it up FAST and at LOW COST
with standard HALLOWELL Shop Equipment

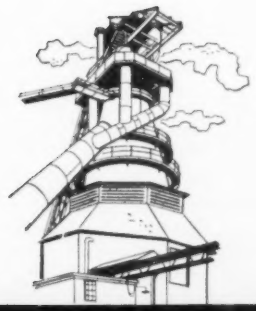
You'll save time—you'll save money—and you'll get the adaptability that only a full line of interchangeable equipment can give you. Let us help you engineer your space for maximum efficiency. Write for complete details about standard ready-made HALLOWELL Shop Equipment—stocked by leading distributors everywhere. STANDARD PRESSED STEEL Co., Jenkintown 26, Pa.



1. Cabinet Benches
2. Tool Stands
3. Stools and Chairs
4. Drawer Tiers

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

For more facts circle 512 on Reply Card



Here's a one-punch knockout for acid vapor corrosion

THIS blast furnace blending room roof gets a steady diet of sulphurous acid, high moisture and coke fumes. It's enough to make any metal cry Uncle. But one economical, easy-to-apply application of *Pitt Chem* Tar Base Coating licked this rugged corrosion problem.

No matter how large, small, simple or complex *your* corrosion problem is, your best chance of solving it is with *Pitt Chem* Coatings. They are formulated to fully utilize the excellent resistance of coal tar pitch to moisture, mineral acids, alkalis and weather. No other material does such a complete job of protection at so little cost.

If you have a corrosion problem that's stumping you, why not have your engineers get together with ours. It's a business-like move to protect your investment in plant and equipment. A call is all that's needed. Or see our catalog in Sweet's Plant Engineering File.

Write For FREE Corrosion Control Booklet

Tells where tar base coatings can save you money in your plant . . . what grades to use . . . how to apply them.

W&D 4967

PITTSBURGH COKE & CHEMICAL CO.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

For more facts circle 513 on Reply Card

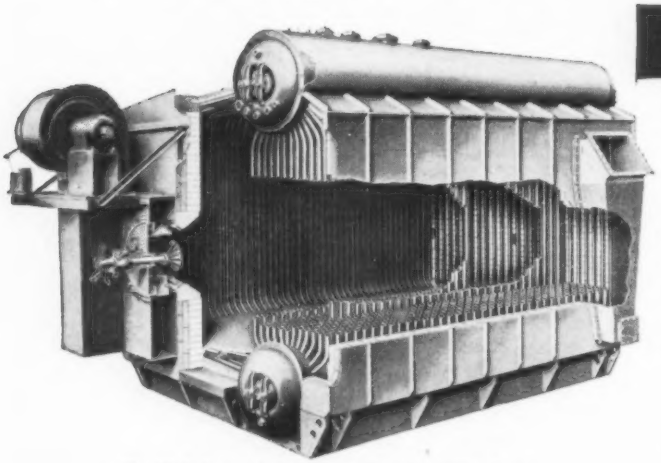
FOR STEAM CAPACITY up to 60,000 POUNDS

Choose your boiler from these two

If you burn oil or gas, investigate the VP Package Boiler for capacities up to 30,000 pounds per hr . . . the VU-10 up to 60,000 pounds.

For stoker firing, the VU-10 is available from 10,000 to 60,000 pounds of steam per hour.

Whatever your fuel . . . whatever your steam capacity requirements up to 60,000 pounds per hour — you'll find that one of the Combustion Engineering Boilers described below will be just right for you.



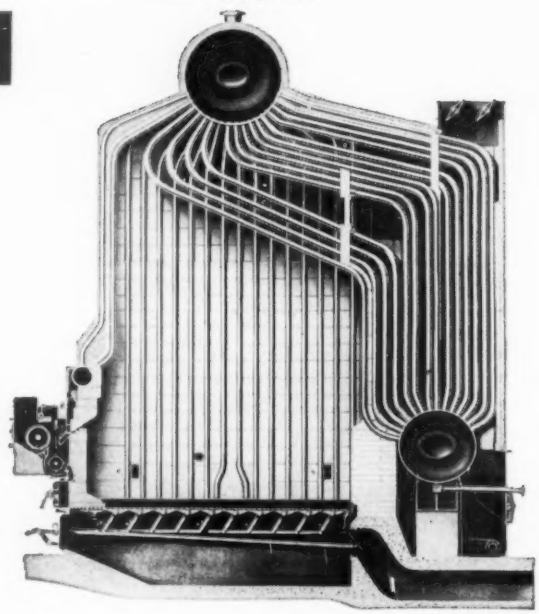
The VP Boiler — the Package Boiler with EXTRA Features

THE VP BOILER

The C-E Package Boiler, type VP . . . completely shop-assembled . . . for oil or gas firing. It is available in capacities from 4,000 to 30,000 lb steam per hr; for pressures to 250 psi. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large (30-in. diameter) lower drum permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. The centrifugal fan is efficient, yet its noise level is less than half that of typical high-speed blowers used on most package boilers. Baffle arrangement is simple, resulting in low draft loss . . . simple soot blowing . . . elimination of dead pockets . . . high heat absorption.

THE VU-10 BOILER

The VU-10 Boiler is designed for industrial load conditions, particularly for plants with small operating and maintenance forces. Capacities range from 10,000 to 60,000 lb steam per hr . . . pressures to 475 psi . . . heat recovery equipment is available if desired. Fuel can be either coal (C-E Spreader, Traveling Grate or Underfeed Stoker) oil or gas. This boiler is a completely standarized design adaptable to many conditions. It responds readily to variations in load; it is simple to operate and maintain. All parts are easily accessible for inspection. Like the VP, the VU-10 Boiler is a complete unit — boiler, furnace setting, fuel-burning equipment, controls, forced draft — bringing you the benefit of one contract . . . one guarantee . . . one responsibility.



The VU-10 Boiler, as arranged for C-E Spreader Stoker firing

COMBUSTION ENGINEERING, Inc.

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

For more facts circle 514 on Reply Card

B-689B

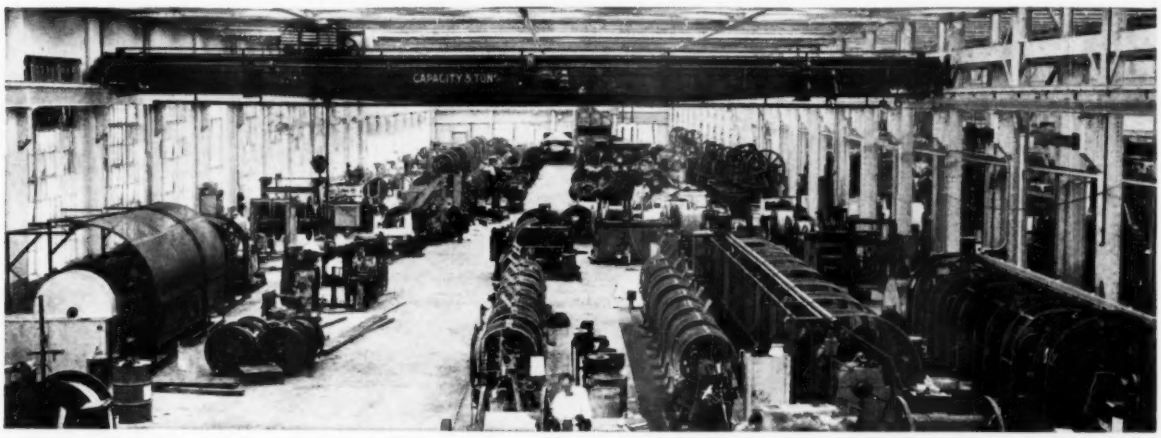
INCREASING USE OF ELECTRIC POWER CALLS FOR MODERN DISTRIBUTION SYSTEMS

General Electric's expanding wire and cable facilities and services can help you handle new or greater loads

The continuing development of new electrical equipment, processes, and materials handling methods doubles the use of electricity about every ten years—according to the findings of qualified authorities. In industry, this increasing use of power makes it important that you plan, install, and maintain bigger and more flexible distribution systems to handle these growing loads. To assist you, General Electric has expanded its facilities, and is prepared to help you in the application, use, and maintenance of modern distribution systems.

1 PLANNING AND APPLICATION.

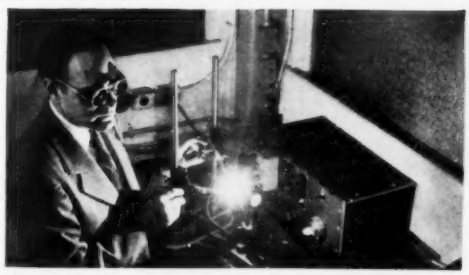
G-E wire and cable specialists are ready to help you select and plan cable systems with the capacity and flexibility needed for growing loads.



2 WIRE AND CABLE AVAILABILITY.

General Electric is adding a new wire and cable plant to its facilities in Bridgeport, Connecticut, to continue to supply you with the products on which cable systems depend. This new plant will be able to produce more cable faster, and will supply you with new cable products to meet new needs.

If you want help NOW . . . just call your G-E wire and cable specialist, or write Section W121-264, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



3 MAINTENANCE OF CABLE SYSTEMS.

General Electric's test facilities help minimize maintenance problems. Thorough production-line testing, coupled with research and developmental testing, give you wire and cable products with longer life and coordinated insulation levels. Also, the flexibility designed into G-E wire and cable systems make it possible for you to alter and expand these systems as loads change and grow. (This spectrographic test for copper conductor purity is one example of G.E.'s laboratory testing.)

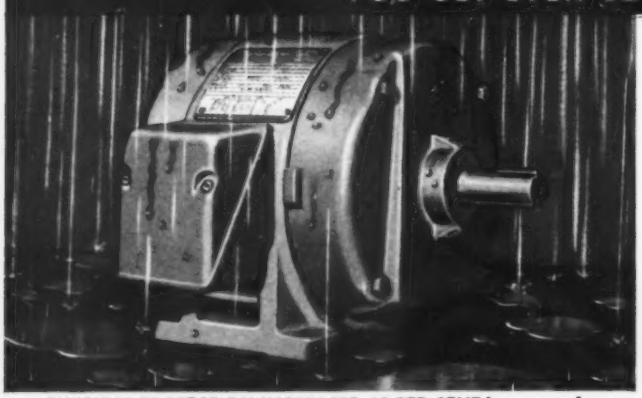
You can put your confidence in—

GENERAL ELECTRIC

For more facts circle 515 on Reply Card

For more facts circle 516 on Reply Card →

YOU GET EVEN LONGER MOTOR LIFE



PHYSICAL PROTECTION INCREASED 60 PER-CENT by a complete redesign of cast-iron frame and end shields. This motor is suitable for many jobs where ordinary dripproof motors should not be applied.

EXTRA ELECTRICAL STRENGTH is assured by use of new polyester film insulation. A silicone coating, Dri-film,* virtually eliminates stator insulation failure caused by moisture.

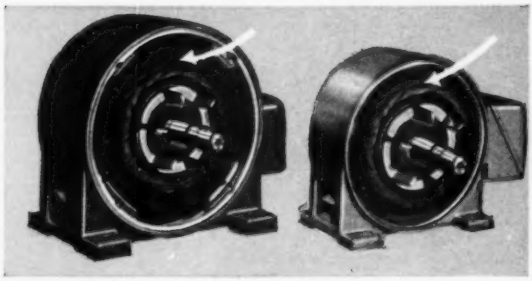
*REG. U.S. PAT. OFF.

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

GENERAL ELECTRIC ANNOUNCES...

THE ALL-NEW TRI 55 CLAD MOTOR

REG. U.S. PAT. OFF.



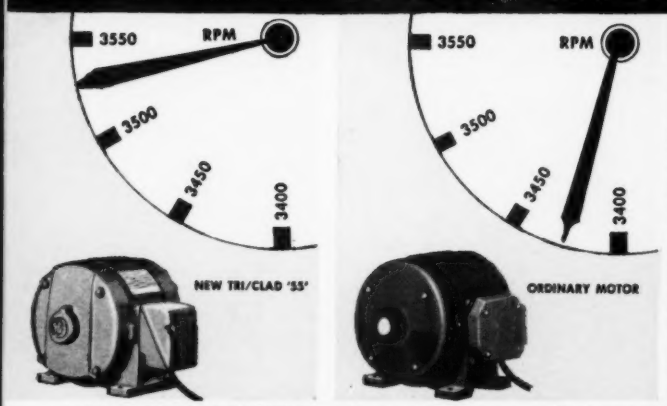
LIGHTER, SMALLER Tri/Clad '55' motors have been made possible through better use of space within the frame. Active materials (magnetic steel, copper) have not been sacrificed.

Complete Line of Dripproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

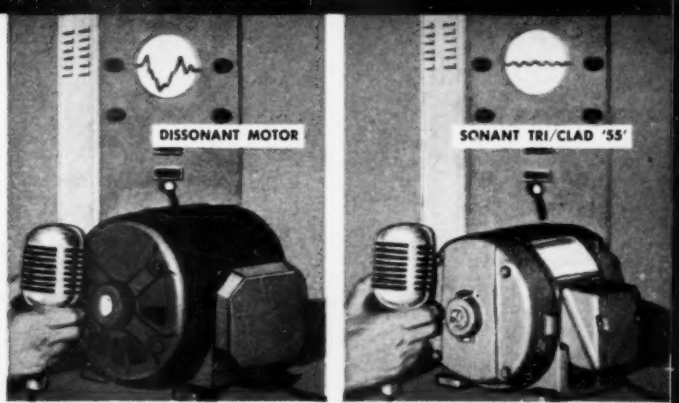
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Dripproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

YOU GET EVEN BETTER PERFORMANCE



HIGHER FULL-LOAD SPEEDS is only one of many improved characteristics of this new G.E. motor. Above shows comparison of an ordinary motor with the Tri/Clad '55' — both rated at 3600 rpm.



SONANT OPERATION of the new Tri/Clad '55' motor has been laboratory tested and proven. Motor operates at reduced noise level, and operating sound is pitched to a more pleasant frequency.

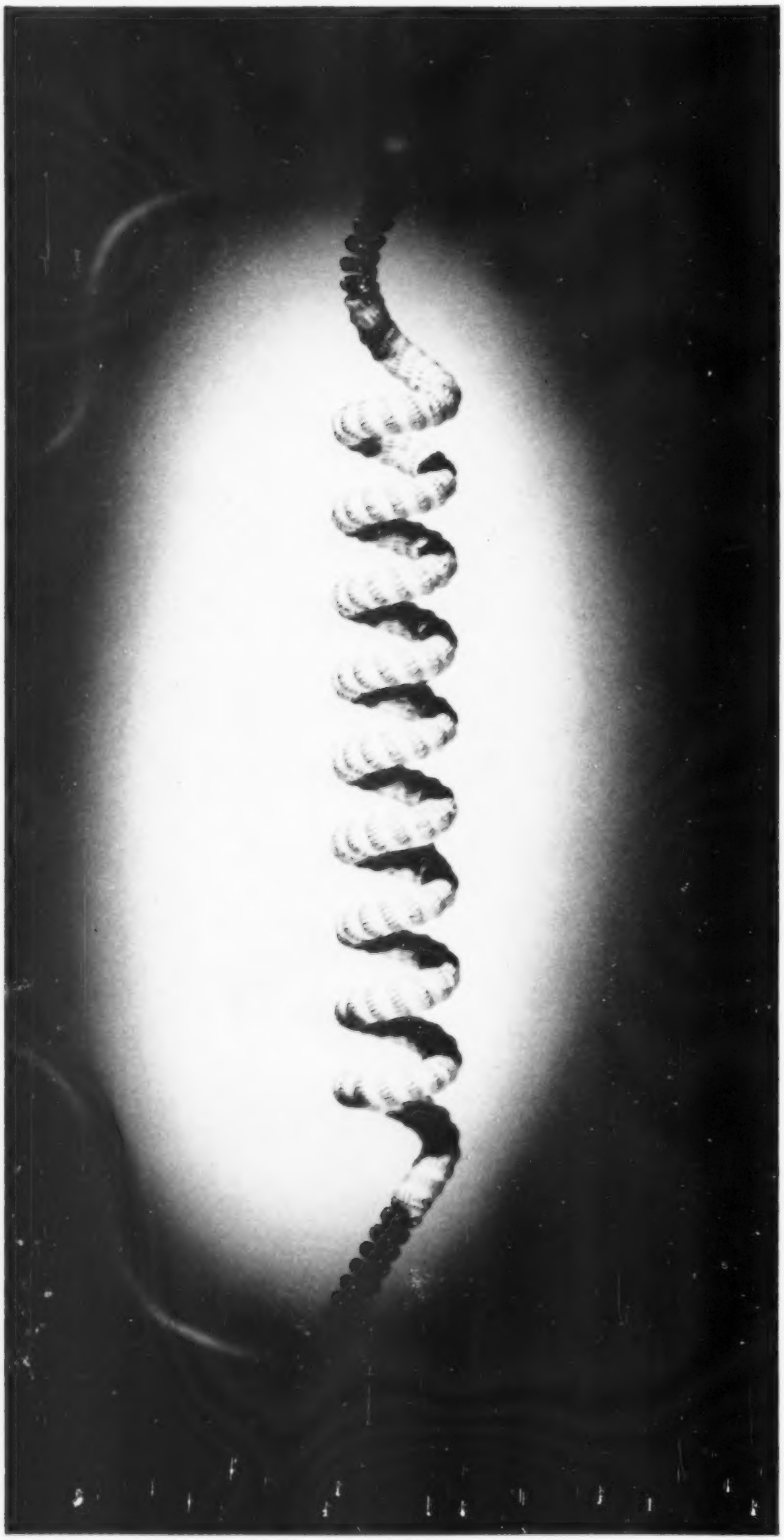
YOU GET EVEN MORE INSTALLATION AND MAINTENANCE SAVINGS

NEW BEARING SYSTEM allows this motor to run longer than other motors without regreasing. One reason—greatly improved synthesized grease with 8 times the mechanical stability of ordinary grease.

EASIER TO SERVICE, the new Tri/Clad '55' has larger conduit box diagonally split for simplified wiring. Perma-numbered leads mean that even clipped and stripped wires are instantly identified.

Progress is our most important product

GENERAL ELECTRIC



New twist on old idea makes G-E fluorescent lamps last longer

ONE of the most important materials in a fluorescent lamp is the little bit of chemical at each end of the tube. The current flows through it, electrons flow out, and the lamp starts to glow.

The old idea was to hold the chemical on a double-twisted wire coil. General Electric's new idea was to go that one better: give the wire a *triple* twist. This not only holds more chemical, it also holds it longer.

The result of course is longer lamp life and more light for your money.

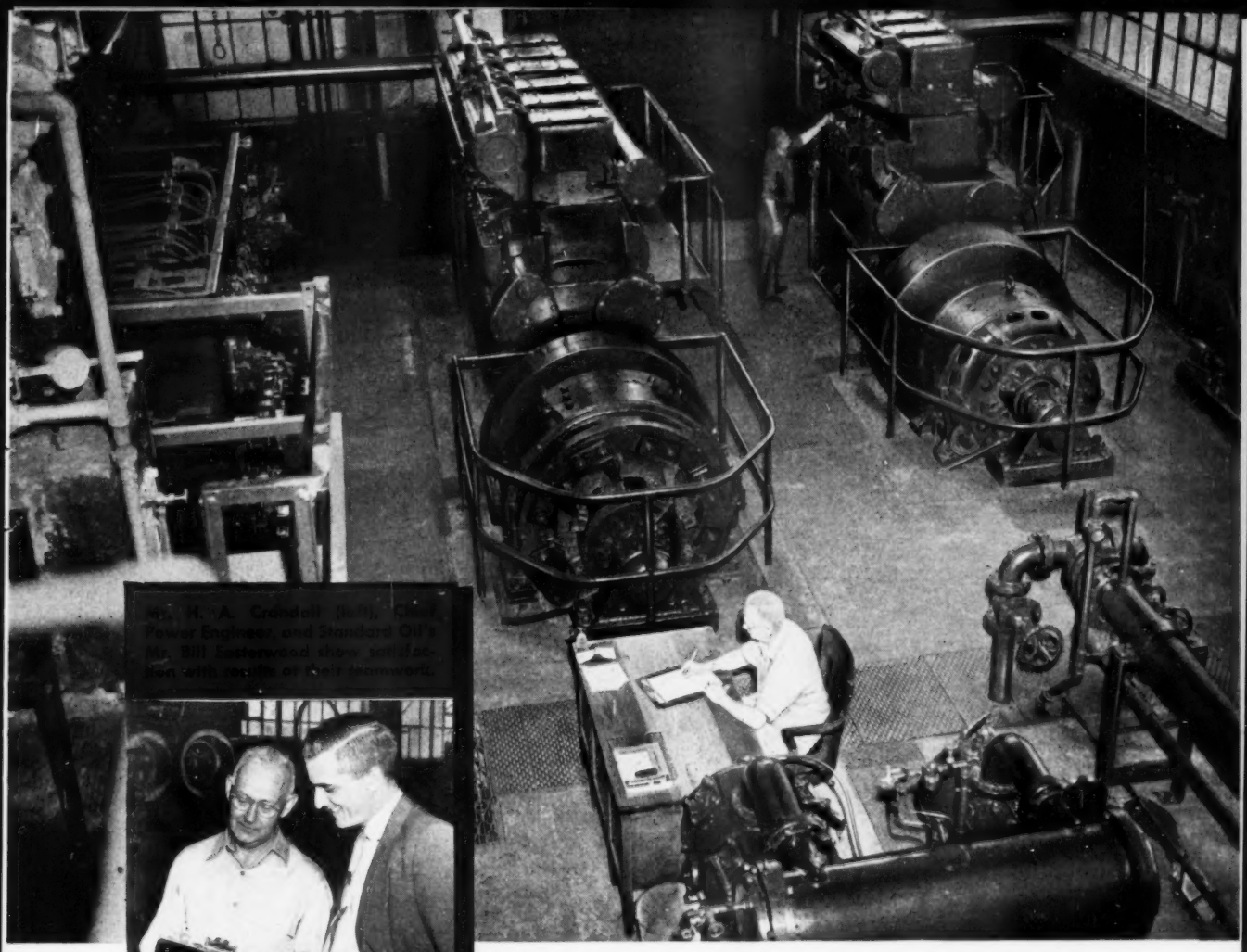
General Electric's triple coil is used in G-E slimline and other G-E instant-start lamps. Just one more example of why...

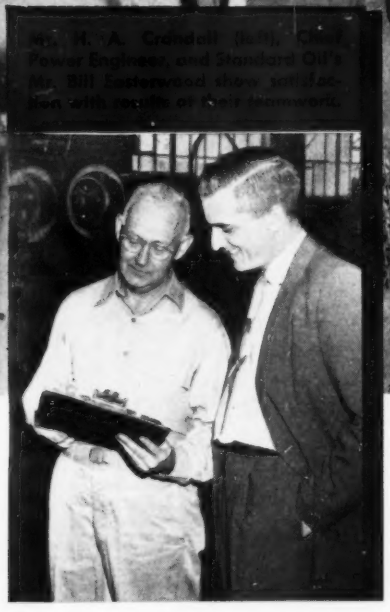
You can expect the best value from General Electric fluorescent lamps

You can put your confidence in—

GENERAL ELECTRIC

For more facts circle 517 on Reply Card





Here's a 27,000-hour record for low wear and clean operation!

● This diesel power plant serves a large midwest manufacturer of steel products.

The plant superintendent was increasingly aware that lubrication of his two diesels was not all that it should be. There was trouble with stuck rings, and crankcases showed excessive deposits. Working with a Standard Oil lubrication specialist, the superintendent switched his engines to STANDARD HD Oil.

During some 27,000 hours' operation of each unit, engines have remained exceptionally clean. Ring sticking troubles have been eliminated. Cylinders have shown less than 0.01" wear — a reduction of 50% over the previous, similar period. Neither of the original fills of STANDARD HD have needed to be replaced.

Midwest diesel operators are getting record efficiency and economy with the help of STANDARD HD. Your Standard Oil lubrication specialist can help you get similar results. Phone your local Standard Oil office. Or, write: Standard Oil Company, 910 South Michigan Ave., Chicago 80, Ill.

STANDARD HD
TRADE MARK
OIL

STANDARD OIL COMPANY

STANDARD (Indiana)

For more facts circle 518 on Reply Card

The ductwork insulation that goes on fast . . . lowers insulation costs!

PPG Superfine Fiber Glass is today's most versatile hot or cold duct insulation. It combines higher insulating value than most other commonly used materials with complete ease of cutting and wrapping. Its high insulating and sound absorbing efficiency usually means a lesser thickness of PPG Superfine will do the job.

Because it is so easy to handle, PPG Superfine goes up fast . . . cuts labor costs. From the chart at the right, select the specification which exactly fits your need.

For complete buying information or technical assistance on your particular insulating problem, write to our executive offices or district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Washington. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.

Type	Density (lbs. per cu. ft.)	Thickness (Inches)	Approx. Sq. Ft. Per lb.	Typical Roll Lengths (Feet)	Approx. O.D. of Rolls (Inches)
S-314	0.6	½	40	100	17
		¾	26.7	100	21
		1	20	100	24
		1½	13.3	100	30
		2	10	100	35
		3	6.7	100	42
S-315	0.75	¼	64	100	12
		½	32	100	17
		¾	21.3	100	21
		1	16	100	24
		1½	10.7	100	30
		2	8	100	35
		3	5.3	50	30
S-316	1.0	¼	48	100	11
		½	24	100	16
		¾	16	100	20
		1	12	100	23
		1½	8	100	27
		2	6	100	32
		3	4	100	39
S-317	1.5	¼	32	100	11
		½	16	100	16
		¾	10.7	100	20
		1	8	100	23
		1½	5.3	100	27
S-318	2.0	¼	24	100	14
		½	12	100	19
		¾	8	100	24
		1	6	100	29
		1½	4	50	24
S-319	3.0	¼	16	100	19
		½	8	100	26
		¾	5.3	100	33
		1	4	50	20

ROLL WIDTHS—Pittsburgh Superfine is available in standard roll widths of 18", 24", 36", 48", 54", and 72" and can be supplied in any desired slit width down to 2". Rolls are wound on 2" tubes and wrapped in heavy Kraft paper.

SPECIAL FACINGS—Facings, such as reinforced duplex Kraft, reflective surfaced reinforced duplex Kraft, Aluminum Foil (.0025, .0007, .001), Aluminum Vinyl Film, Aluminum Foil on Paper, Asbestos Paper, Muslin and Cotton, and Vinyl Coating, can be furnished on request.

FIBER PPG GLASS **PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS**

PITTSBURGH PLATE GLASS COMPANY

For more facts circle 519 on Reply Card

Actually see Rust-Oleum applied directly over sound rusted surfaces in your own plant.

Get proof of performance right in your own plant! See Rust-Oleum 769 Damp-Proof Red Primer applied over *your own* rusted metal after simple scraping and wire-brushing to remove rust scale and loose rust. Rust-Oleum's *specially-processed* fish oil vehicle penetrates rust to bare metal — saving time, labor and money.

Rust-Oleum finish coatings in Aluminum, Gray, White, Black, Orange, Blue, Yellow, Green and others provide both *Rust Prevention and Decorative Beauty!* Specify Rust-Oleum for new construction, maintenance and re-modeling. See Sweet's for catalog and nearest Rust-Oleum Industrial Distributor, or clip coupon to your letterhead . . .

There Is Only One Rust-Oleum. It is as Distinctive as Your Own Fingerprint.

RUST-OLEUM®

STOPS RUST!

See local classified telephone directory under Rust Preventives or Paints for nearest Rust-Oleum Industrial Distributor

ATTACH TO YOUR BUSINESS LETTERHEAD AND MAIL TO:

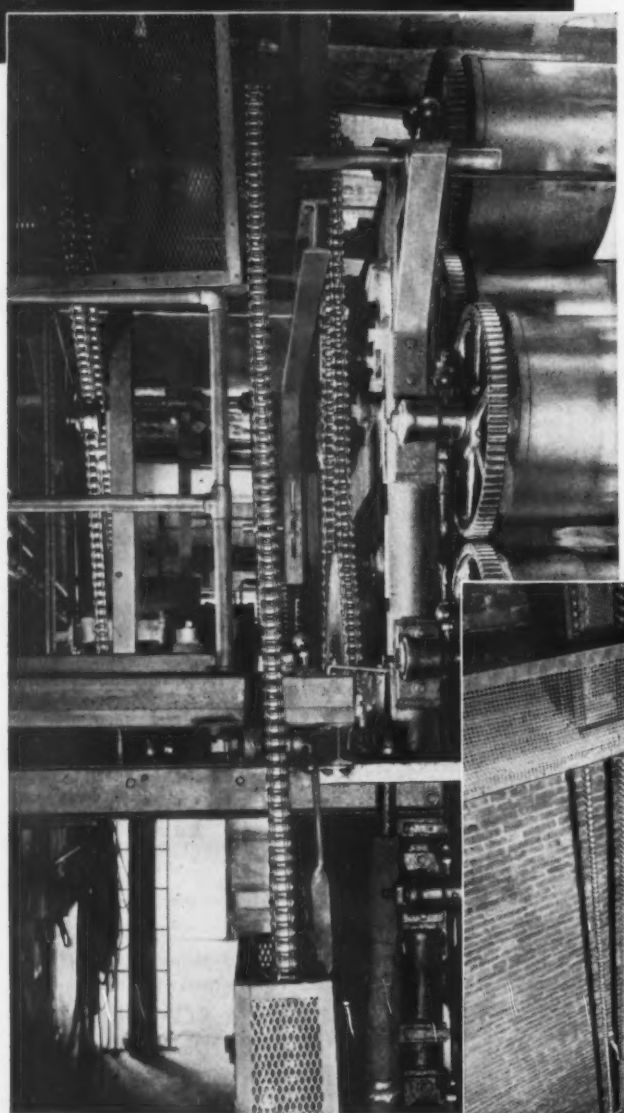
RUST-OLEUM CORPORATION
2722 OAKTON STREET, EVANSTON, ILL.

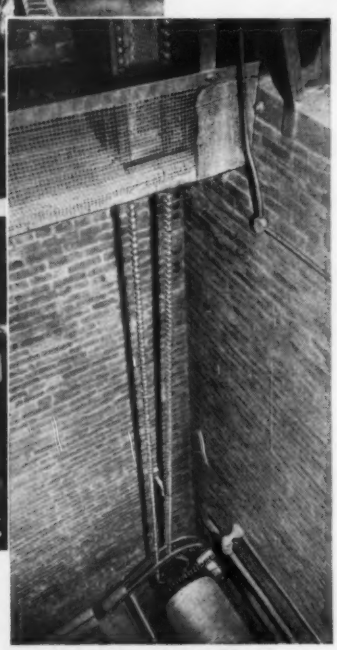
- ☐ Please show Me the Rust-Oleum "Rusted Panel Demonstration."
- ☐ Test Application of Rust-Oleum Over Rusted Metal Surfaces in My Plant.
- ☐ Complete Literature with Color Chart.
- ☐ Nearest Rust-Oleum Industrial Distributor.

For more facts circle 520 on Reply Card

LONG DISTANCES BETWEEN SHAFTS?

. . . no problem at all, with Diamond Roller Chains





The two illustrations below show how the engineers of a large flooring product manufacturer coordinated operation of specialized equipment by means of Diamond Roller Chains.

Shafts far apart—on different floors—were driven with the positiveness of gears, with speed ratios selected and maintained to insure the proper rotation of series of drums in the continuous manufacturing process.

With Diamond Roller Chains long-life dependability is insured — there is no stretch or creep—little or no maintenance. In processing plants of all kinds where speed ratios between successive production steps must be accurately set and maintained, where shaft distances may vary widely—you too will find Diamond Roller Chains readily adaptable.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Traditional

Dept. 614, 402 Kentucky Ave., Indianapolis 7, Indiana

Offices and Distributors in All Principal Cities

Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND ROLLER CHAINS

Write for New Catalog 753 which lists all standard Chains and Sprockets.

Note the long shaft center distances and variety of Diamond Roller Chain applications.

For more facts circle 521 on Reply Card

On Cranes of All Types, The

Tuffy Team

Will Run Longer!

Now, there is no need to monkey with a lot of different rope constructions trying to find a hoist line and sling combination that will give you the most service. This pair of special purpose constructions will handle your crane work as it never was handled before.

Oldest of this tough work-team is Tuffy Slings. From the very start they set new standards of service life throughout industry—continue to set records in keeping sling cost down and the safety record clear. The reason? An entirely new patented 9-part machine braided wire fabric construction so flexible you cannot materially damage the fabric when kinking and knotting, and so tough that users asked for a hoist line to match in wearability.

Newest of the hoisting team is Tuffy Hoist Line. It's a new rope construction, specially designed for the special purpose of hoisting on any and all cranes. Designed into it is flexibility, wearability and extra toughness to absorb load shocks. Taken out of it is every undesirable feature which many months of laboratory research and testing and many more months of field testing uncovered in other rope constructions used for hoist lines.

Just length, diameter and "Tuffy Hoist Line" is all you need to say! No complicated specifications, no chance for confusion! Get *extra* hoisting service at no extra cost with Tuffy Hoist Line!

NEW **Tuffy** HOIST LINE

Tuffy SLINGS

48-Page Handbook and Riggers' Manual, sent to you on request! Write today for handbook and complete information on Tuffy Hoist Line.

Be Sure...Be Firm
Tell Your Distributor Tuffy Hoist Line... and the diameter and length—that's all he needs to know! For slings, specify Tuffy, sling type, diameter, length and fittings. Or buy Tuffy Braided Wire Fabric on the reel if you do your own rigging. Remember, your distributor can always supply the Tuffy you need!

union Wire Rope **corporation**

2272 Manchester Ave. • Kansas City 26, Mo.

Specialists in High Carbon Wire, Wire Rope and Braided Wire Fabric

For more facts circle 522 on Reply Card

"THIS LUBRICANT EXTENDED BEARING LIFE 50%"

—says REPUBLIC AVIATION CORP.
Makers of the famous F-84E THUNDERJET

"Under actual tests, LUBRIPLATE extended bearing life fifty per cent or better as compared to other lubricants. It was also found that, during test, LUBRIPLATE increased efficiency of machines twenty per cent by reducing friction loss. Republic has been using LUBRIPLATE successfully for the past eight years."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 523 on Reply Card

BACKTALK about our past issues

Edited by R. L. Marinello

Who Has the Answers?

PLANT ENGINEERING:

"I am trying to accumulate some data related to Industrial Plant Maintenance, but as of this date, I have been unable to obtain figures on the following:

"1. The estimated number of people in the United States engaged in Industrial Maintenance supervision during the year 1953. This figure would include all first line supervision, but would not include leadmen or personnel who devote less than 100 per cent of their time to supervision.

"2. The estimated dollar value of plants and equipment over which the above supervision is responsible. This figure, I believe would be a 1953 estimate of all plants and equipment in the United States.

"The figures, in both cases, which are being sought are estimated figures and could be round figures.

"If these figures are not available from you, I would appreciate very much knowing where they may be obtained." *R. J. Korstian, 607 Country Club Road, Brevard, North Carolina.*

► We are a little abashed to admit that we have no data on the figures you requested. If any readers have figures on the data sought by Mr. Korstian, he would be glad to hear from you.—*Editors.*

Mr. Rudniski Keeps Us Informed

A letter from Mr. Rudniski, Assistant Plant Engineer, Ontario Malleable Iron Co., Ltd., Oshawa, Canada, appeared in the Backtalk section of the November issue. A portion of that letter is repeated below.

"In our galvanizing department, we pass small malleable iron parts to be galvanized by hot dipping through several washing, rinsing and fluxing baths. One of these is a bath of zinc ammonium chloride solution at about 160 F and it constantly springs a leak.

"In the August 'Nylon and Teflon' article you mention the stability of Teflon against most alkalies, solvents, etc., which suggests that a lining of this material might be the answer to our problem."

PLANT ENGINEERING asked Mr. Rudniski to notify us if he found a solution to this problem. A second letter from Mr. Rudniski appears below.—*Editors.*

"Frankly, nothing has been done other than a test started to see what affect the solution had on stainless steel tubes rather than ordinary steel tubes used to heat this solution by passing steam through the tubes.

"Thus far, the stainless steel tubes seem to be unaffected and we are considering the construction of a steel framed stainless steel tank. This, we feel, would probably be preferred to the plastic lining of Teflon which could easily be scuffed off in regular handling of perforated barrels in the tank.

"Thank you for your interest and the help provided in aiding us to find a solution to this problem." *J. Rudniski, Assistant Plant Engineer, The Ontario Malleable Iron Co., Ltd., Oshawa, Canada.*

Dog-Eared Tear Sheets

PLANT ENGINEERING:

"I am writing to request reprints of a series of articles on Maintenance of Electrical Switchgear and Equipment that appeared in PLANT ENGINEERING in the latter part of 1951 and early 1952.

"The tear sheets of these articles which we have used up to now have gotten so much use that they are now dog-eared and need replacing.

"If it would be of interest to you, I would like to go on record as being very much in favor of the recent selection of articles you have included—specifically, those on construction and construction methods, 'News from Plants' and the Court Decisions." *E. Donald Reichert, Plant Engineer, Up-Right Scaffolds, Division of Up-Right, Inc., Berkeley, Calif.*

► Editors are always glad to hear that the articles are being put to good use. A fresh supply is being sent to you. It's also nice to hear that you like the new departments.—*Editors.*

Whistle Warns of Pressure Drop

PLANT ENGINEERING:

"Mr. Vukich's article 'Emergency Breeds a Safety Device' appearing in the November issue was very interesting. I would like to pass on to PLANT ENGINEERING readers how we here at Magnus solved the same problem which Mr. Vukich had in his plant.

Although Mr. Vukich's device is excellent, it appears to be a rather expensive and complicated installation. I had three low pressure alarm whistles installed in the machine areas three years ago at a very low cost (much less than the price of one diaphragm valve) set to blow when the line pressure fell below 75 psi (15 psi below normal 90 psi). The alarms emit a loud, shrill, unmistakable whistle that can be heard above any noise level in the plant. Because of the possible human failure to reopen shut-off valves, we exhaust the air lines at the compressor through a large spill valve.

"The alarm valves were made by Airlarm, P. O. Box 13034-A, Houston 19, Texas. For installation, a tee is inserted in the air line and the alarm screws directly into the tee. It is set for the desired critical pressure and needs no further attention. I would suggest any one facing such a loss of pressure problem to contact Airlarm for further information." *F. Harry Neidig, Plant Engineer, Magnus Metal Division of National Lead Co., Depew, New York.*

(Continued on page 28)

Any way you figure it, corrosion of steam and condensate lines is a serious problem . . . and a costly one! Replacement of corroded lines, interrupted production, increased labor and maintenance send costs spiraling far beyond the limits of economical plant operation. But something can be done about it *right now*, with complete assurance of satisfactory results.

Take the case, for example, of a large plastics molding plant which operated the cycle on its molding machines alternately with steam and oxygen-saturated cooling water. Under these conditions, severe corrosion resulted. Check valves on the steam supply lines to the machines had an average life of only one week—*sometimes even less!* Costs were skyrocketing.

Here's what Betz did about it. By applying its patented filming amine treatment, piping and valve losses stopped *immediately!* After three years' treatment with this advanced technique, satisfactory corrosion control continues. What's more, plant records show savings in labor and maintenance have averaged 30 times the cost of the treatment applied.

This is just one example of how Betz Engineers help keep plants *like yours* at peak operating efficiency. Why not get in touch with Betz today as the first step toward solving your particular water problems. There's no obligation, of course. W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: Betz Laboratories Limited, Montreal 1.

For the full facts and figures on how BETZ is solving return line corrosion problems in plants like yours, write today for Technical Paper No. 124.

BETZ

CONSULTANTS ON ALL WATER PROBLEMS

For more facts circle 524 on Reply Card

Tire molds at Thompson Aircraft Tire Corp., San Francisco, California

Aluminum Paint: Inertol Co., Inc., Newark, New Jersey

ALUMINUM PAINT
resists scuffing at 300°F

Designed to retread aircraft tires for the U. S. Army, Navy and commercial airlines, these molds operate 24 hours a day at 300°F. The paint *must* withstand this continuous baking temperature without scuffing, peeling, flaking or any way contaminating materials used in the retreading operation. Absolute cleanliness is essential. Inertol Interior High Heat Aluminum Paint No. 433 (ALCOA Pigments, of course) meets all of these requirements. No wonder it has been specified and used successfully for more than five years.

Special-formula, high heat aluminum paints have been developed jointly by ALCOA and leading manufacturers for use in "hot" industrial applications such as this. Paints made to these formulas last longer, cover better, stand up better under high temperatures, corrosive smoke and fumes.

ALCOA does not make paint. But ALCOA Aluminum Pigments are used in more aluminum paints than any other brand. Look for the ALCOA shield on the paint that you buy. It's your assurance of top quality and performance in aluminum paints—top protection for industrial installations. Write today for information.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

FREE BOOKLET tells how to paint with aluminum.

Aluminum Company of America, Paint Service Bureau
1790-B Alcoa Building, Pittsburgh 19, Pa.

Please send your free book, *Painting with Aluminum*. I plan to paint_____

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Company_____

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City_____ Zone____ State_____

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BACKTALK

(Backtalk begins on page 26)

Casting Specifications

PLANT ENGINEERING:

"We have found the article entitled 'Tips on Casting Specifications — One or a Thousand,' as published in the December, 1953, issue, very interesting.

"We would like to have for our use two or three additional copies of the December issue and would greatly appreciate your forwarding same to the attention of the writer." *Walter L. Seelbach, President, Superior Foundry, Inc., Cleveland, Ohio.*

▶ The editorial department is only too happy to send you three additional copies of the December issue.—*Editors.*

Pipe Sizing Charts

PLANT ENGINEERING:

"We are most interested in your charts covering correct sizing of piping for steam supply and condensate return for heating systems.

"Are these same charts for sale in usable sizes? If so, we would be much interested in securing a quantity." *A. Nolan, S. J. Reynolds Co., Inc., Chicago, Illinois.*

▶ Tear sheets of these charts are being sent to you and we would like to suggest that you contact a photostat company for prices on giant photostats. It is our understanding that these can be held to accurate reproductions.—*Editors.*

Vocational Guidance

PLANT ENGINEERING:

"This office is preparing a vocational guidance handbook for the use of seniors in the high schools of Los Angeles City. The book is intended to help young people select their future occupations. We are desirous of having the publication amply illustrated with photographs of persons performing a wide range of occupations.

"The thought occurs to us that your magazine might be willing to let us publish some of your used or unused photographs which show persons engaged in tasks or operations typical of the occupations in your industry. We shall be pleased to give the customary credit for the privilege of using these pictures." *John Allan Smith, Supervisor, Vocational Guidance, Los Angeles City Board of Education, Los Angeles, California.*

▶ Inasmuch as our reader is the man in the supervisory position, it is rather difficult to picture him at tasks other than on a construction project, overseeing a maintenance operation, consulting on plant layout and planning and similar occupations. We are pleased to make these photographs available to you and hope they will serve your purpose.—*Editors.*

and Mr. Smith's Reply

PLANT ENGINEERING:

"Please accept our warm appreciation for your most prompt and courteous attention to our request for photographs.

"They have been submitted to our artist for incorporation into the publication *Plotting Your Course* which, we hope, will be ready for distribution by the end of this school year. It will be a privilege to acknowledge your cooperation in this publication." *John Allan Smith, Supervisor of Research and Vocational Guidance, Los Angeles City Board of Education, Los Angeles, California.*

Queries on Storage Article

PLANT ENGINEERING:

"In the November, 1953, issue there is an article entitled 'Open-Air Tooling Storage at $1.38 a Square Foot Cuts Losses,' by Mr. Roy J. Breummer, Plant Engineer, Magna Mill Products Co.

"We would appreciate knowing, if possible, (a) the type of solvent used in the cleaning bath, and (b) the type of material used as a protective coating and if it is applied with an ordinary paint sprayer." *J. G. Gardner, Plant Maintenance Engineer, Polymer Corp., Limited, Sarnia, Canada.*

▶ We have requested Mr. Robert Anderson of Dearborn Chemical Co. to send you complete information on Dearborn Chemical's No-Oxid rust preventive treatment along with information regarding solvents for use with No-Oxid. and method of use.—*Editors.*

Likes PE

PLANT ENGINEERING:

"Please send me the entire series of reprints of the lighting articles written by Mr. Leonard V. James.

"The December, 1953 issue is my first contact with PLANT ENGINEERING and I am very pleased to have had it routed to me. I shall continue to read it monthly in the future." *Paul B. Cochran, Foreman Power, Long Beach Naval Shipyard, Long Beach, Calif.*

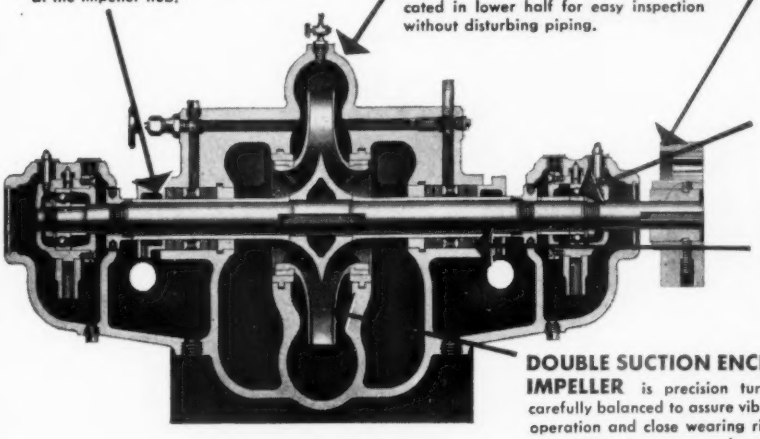
▶ Reprints of the entire lighting series will be available after the first of the year and a copy will be sent to you at that time.—*Editors.*

Look for These 7 Signs of GOOD PUMP DESIGN

CAST SHAFT SLEEVES, not commercial tubing, save the shaft from wear. Sleeves extend through the stuffing box and seal at the impeller hub.

HEAVY HORIZONTAL SPLIT CAST-IRON CASING construction with suction and discharge nozzles located in lower half for easy inspection without disturbing piping.

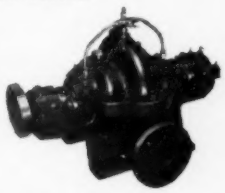
COUPLINGS have *Magic-Grip* quick change bushings for pump and drive shaft. Pin and rubber bushing type usually used. Removal for maintenance is easy.



BALL BEARINGS may be furnished for either oil or grease lubrication. Sleeve bearings also available in larger sizes.

GENEROUS STUFFING BOX LENGTH contains sufficient packing to keep stuffing box maintenance low. Provision is made for sealing water connections or for grease seal if these are required.

DOUBLE SUCTION ENCLOSED IMPELLER is precision turned and carefully balanced to assure vibrationless operation and close wearing ring clearance. Water passages are hand finished to a smooth surface.



STANDARD AND SPECIAL MATERIALS are available for many types of service where government regulations permit. Iron, bronze, stainless steel and combinations of these materials handle both alkaline and acid solutions. Standard sizes carried in stock range from 10 to 7000 gpm with heads as high as 475 feet.

THESE DESIGN AND CONSTRUCTION features of Allis-Chalmers double suction pumps assure long pump life and low maintenance costs. Every A-C double suction pump is carefully tested on the most modern pump testing equipment in the industry.

Complete Pumping Unit

Allis-Chalmers can furnish the complete pumping unit — pump, motor, control and drive — all of coordinated design and manufacture.

Whatever your pumping problem, call your nearby Allis-Chalmers Authorized Distributor or District Office. Or write for Bulletin 08B6146. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3952

Texrope, Magic-Grip, and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
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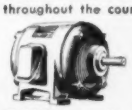
by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.



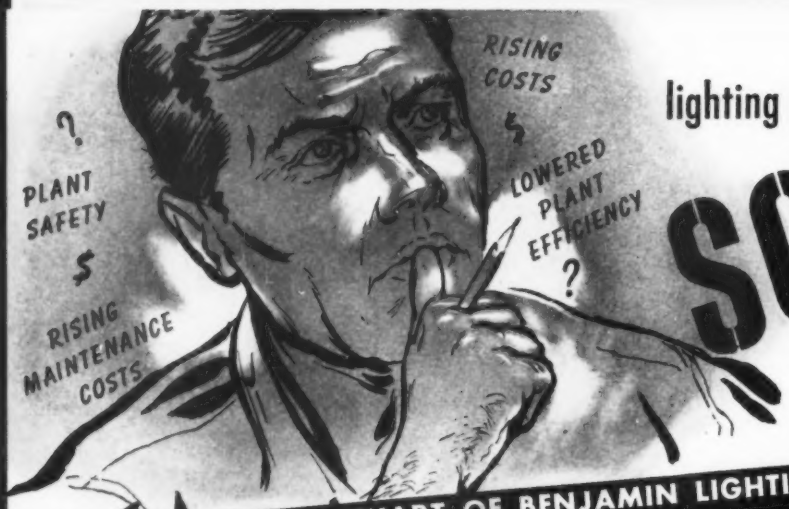
MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

ALLIS-CHALMERS

For more facts circle 526 on Reply Card



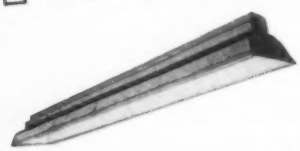
lighting problems SOLVED

for every plant location with a specific Benjamin Unit

☑ THIS CHECK CHART OF BENJAMIN LIGHTING UNITS

shows how lighting can be matched to every seeing task in the plant!

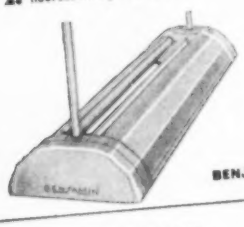
☐ **1.** fluorescent lighting of **GENERAL PLANT AREAS**



Over 300 combinations for matched-to-the-task lighting. Just three channel sizes and four types of reflectors form the backbone of an almost unlimited number of lighting systems for general industrial seeing tasks. Features utilization of high-light-output T12 Slimline lamps and exclusive "Springlox" Lampholders for lower maintenance cost through quicker lamp servicing.

BENJAMIN "Magna-Flo" Systems *described in Manual #1*

☐ **2.** fluorescent lighting to overcome **EXCESSIVE BRIGHTNESS RATIOS**



A new high in seeing comfort for industry! "Task-Master" combines greater upward flow of light with a new high of 35° lamp shielding. Revolutionary new, easier methods of installation and maintenance keep operating and maintenance costs at an all-time low.

BENJAMIN "Task-Master" *described in Manual #2*

☐ **3.** lighting of **HIGH BAYS**

A rugged lighting unit for steel mills, foundries, sheet metal works, and other locations where the lighting units must be guarded against damage from rough handling, flying metal particles, severe mechanical strain or unfavorable atmospheric conditions.

BENJAMIN "Steelite" *described in Manual #3*

☐ **4.** incandescent lighting of **GENERAL PLANT AREAS**

This unit inexpensively matches a variety of general seeing tasks; also for stairways, materials handling areas, etc. Exclusive "Turnlox" detachable reflector cuts time required for cleaning and relamping.

BENJAMIN "Turnlox" Dome Reflector *described in Manual #4*

☐ **5.** lighting for **BINS and SHELVES**

A reflector of unique design, combining uniformity of illumination with careful shielding. Uniformly lights top-to-bottom of shelves, bin tiers in stock rooms, tool cribs and book stacks. Especially adapted for the low mounting heights and narrow aisles of such locations.

BENJAMIN "Stock-Bin-Lite" Reflector *described in Manual #5*

☐ **6.** safe lighting for **HAZARDOUS LOCATIONS**

For locations listed by U.L. as Class 1 Groups C and D. Recommended for areas where explosive atmospheres or inflammable dust is found. Available in a choice of four reflectors and a variety of mountings. Especially constructed to withstand the tremendous pressure of internal lamp explosion.

BENJAMIN "Explosion-Proof" Units *described in Manual #6*

☐ **7.** approved lighting for **HUMID LOCATIONS**

Listed "Vapor-Tight" by U.L. Suitable for use in locations exposed to moisture or non-combustible dust, corrosive fumes, vapors, dust and smoke. Rugged construction, unbroken surface of Porcelain Enamel and heavy-gauge steel assure long life without breakdown or frequent servicing.

BENJAMIN "Vapor-Tight" Units *described in Manual #7*

☐ **8.** proper floodlighting for **OUTDOOR INDUSTRIAL AREAS**

The ideal all-weather unit for industrial recreational areas, ball fields, pools, etc. Highest quality outdoor illumination due to combination of large diffusing Porcelain-Enameled Steel Reflector with inner aluminum reflector.

BENJAMIN "Play Area" Floodlight *described in Manual #8*

B-215R

☑ GET THESE FREE LIGHTING MANUALS!

- ☐ 1. General Plant Lighting (fluorescent)
- ☐ 2. Controlled Brightness for greater seeing comfort
- ☐ 3. High Bay Lighting
- ☐ 4. General Plant Lighting (incandescent)
- ☐ 5. Stock-Bin Lighting
- ☐ 6. Hazardous Locations
- ☐ 7. Humid Locations
- ☐ 8. Industrial Floodlighting

BENJAMIN ELECTRIC MFG. CO., Dept. PE
DES PLAINES, ILLINOIS

Without cost or obligation, please send me Benjamin Manuals covering the subjects I have checked off at left.

NAME AND TITLE_____

COMPANY_____

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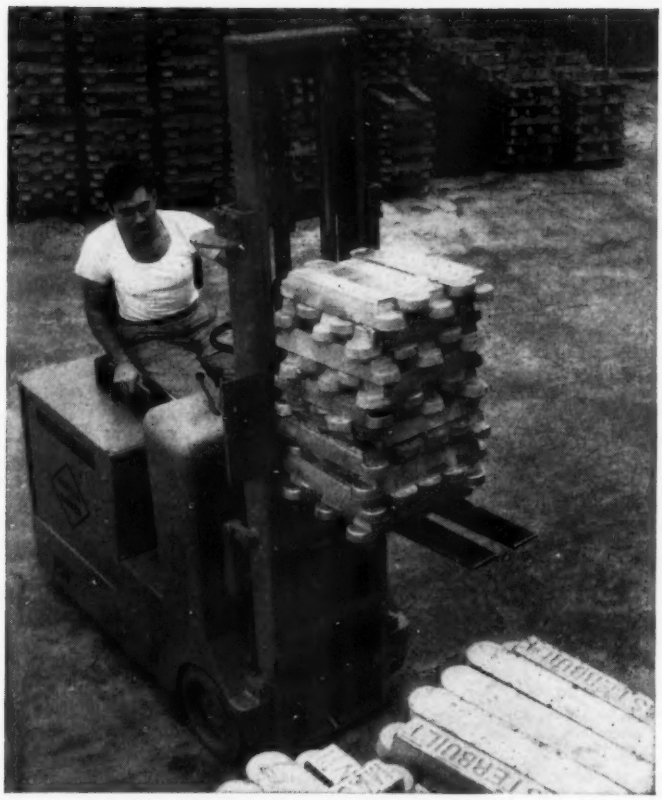
BENJAMIN

Lighting Equipment

sold exclusively through electrical distributors

B.F.Goodrich

FREE TW ANALYSIS can cut your tire maintenance costs 20% or more

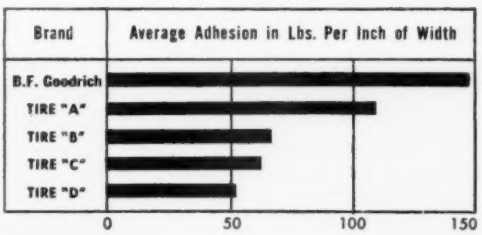


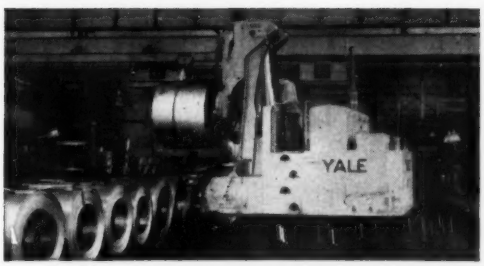
Tire maintenance costs cut 20%. Total tire costs lowered as much as 50%. Such savings have been reported by industrial tire users across the country through the use of the B. F. Goodrich Tire and Wheel Analysis Plan! Contact your local BFG retailer or mail the coupon below. Without cost or obligation, a trained B. F. Goodrich man will study your materials handling operations. He will tell you what type and size tires, what tread design and compound will serve you best.

The advice and counsel you get will be unbiased, for B. F. Goodrich makes a *complete* line of industrial tires. A special TW Analysis is available for manufacturers of industrial hauling equipment.

DO YOU HAVE THIS PROBLEM? Poor adhesion of rubber to steel caused this tire to fail prematurely. The chart below, based on extensive comparison tests of leading makes of tires, proves the superior adhesion qualities of BFG solid industrial tires.

Tests Prove B. F. Goodrich Adhesion Best





Heavy loads and equipment? Overloaded tires fail prematurely. Let BFG show you how to match tire and load.

Cutting and chipping? Rough hauling surfaces soon ruin tires. Your BFG man can show you how to get maximum tire life.

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

The B. F. Goodrich Company
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Department TW-338,
Akron 18, Ohio

Specify B.F.Goodrich tires when ordering new equipment

Please send me:

- ☐ Additional information on your Tire and Wheel Analysis Plan
- ☐ Free copy of "Industrial Tire Guidebook"
- ☐ Free copy of "How to Get Extra Service out of Solid Industrial Tires"

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City_____ Zone____ State_____

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Blanket of Tiny Balloons Reduces Oil Loss

Millions of microscopic balloons of phenolic resin floating in a thin layer on top of crude oil can save as much as $60 million annually for the U. S. oil industry by an 80 to 90 per cent reduction in evaporation loss from oil storage tanks.

Tiny hollow particles have been trade-marked Microballoons by Standard Oil Company of Ohio, which developed them as an evaporation barrier for crude oil storage. Resembling particles of a finely ground, dark flour in bulk consistency, the balloons look like brown ping-pong balls under the microscope. Each balloon is filled with inert nitrogen gas sealed in by thin walls of Bakelite phenolic plastic. The balloons vary from 0.0002 to 0.0036 inches diameter, and have a bulk density of approximately 8.7 pounds per cubic foot.

The resistance of this phenolic resin to oils and most other chemicals prevents the tiny balloons from filling with oil and sinking to the bottom of the storage tank. Their strength and resistance to abrasion keeps the balloons from bursting as they jostle together and against the metal tank walls. The phenolic resin will not soften or liquefy at the high temperatures of refinery units, and will create no harmful effect if the balloons are accidentally drawn into these units.

The new floating blanket provides an economical means of vapor conservation for a great number of existing crude oil storage tanks. For reasons of economy, these cone-roof storage tanks have not been able to use the more expensive vapor conservation techniques such as floating steel roofs. The balloon system can be installed in cone-roof storage tanks with little or no modification.

Cone-topped tank model is used to show how tiny balloons lie on top of oil to reduce the loss through evaporation

Based on working condition tests on various size tanks, small and large, it has been estimated that the evaporation loss can be reduced by about 83 per cent on the average. Normally a 55,000-barrel cone-roof tank would lose about 1,880 barrels of oil annually through evaporation. The balloon seal would reduce this loss to about 320 barrels.

The resulting saving in crude oil valued at three dollars per barrel would be $4,700 per year—almost twice the cost of using the balloons. Performance and cost figures suggest the system will save an amount of crude oil equal to the initial installation cost in one year or less. *From a release of Bakelite Co., Div. of U.C.C., New York, N.Y.*

Quick-Change Industrial Tire

LONGER SERVICE, lower inventories, and speedier, less costly tire replacement are the advantages claimed for a new type of demountable industrial wheel. Extensive field evaluation in a variety of industries has indicated that overall savings can run as high as 30 per cent.

The new demountable wheel features a replaceable tire bonded to an inner band of steel—up to now, only the more expensive wheels, such as the pressed-on types used on fork lift trucks, have offered treads backed by a metal base. The steel band does not warp, stretch or spread during molding operations or in use.

Tire changing becomes a simple, speedy operation. The user need only loosen four bolts, slip off the old tire, slide the new one on, and replace the bolts. The steel rim is

Rails Go Up and Down to Permit Travel of Electric Trucks and Freight Cars

This bridge for handling electric trucks is located at Pennsylvania Railroad 11th Street Freight House in Pittsburgh. It is raised and lowered by a 10-hp motor actuating four large jack screws. Deck of bridge is constructed of wooden planks supported by steel members. (From Storage Battery Power, published by Thomas A. Edison, Inc., West Orange, N.J.)

Wagner®
ELECTRIC MOTORS
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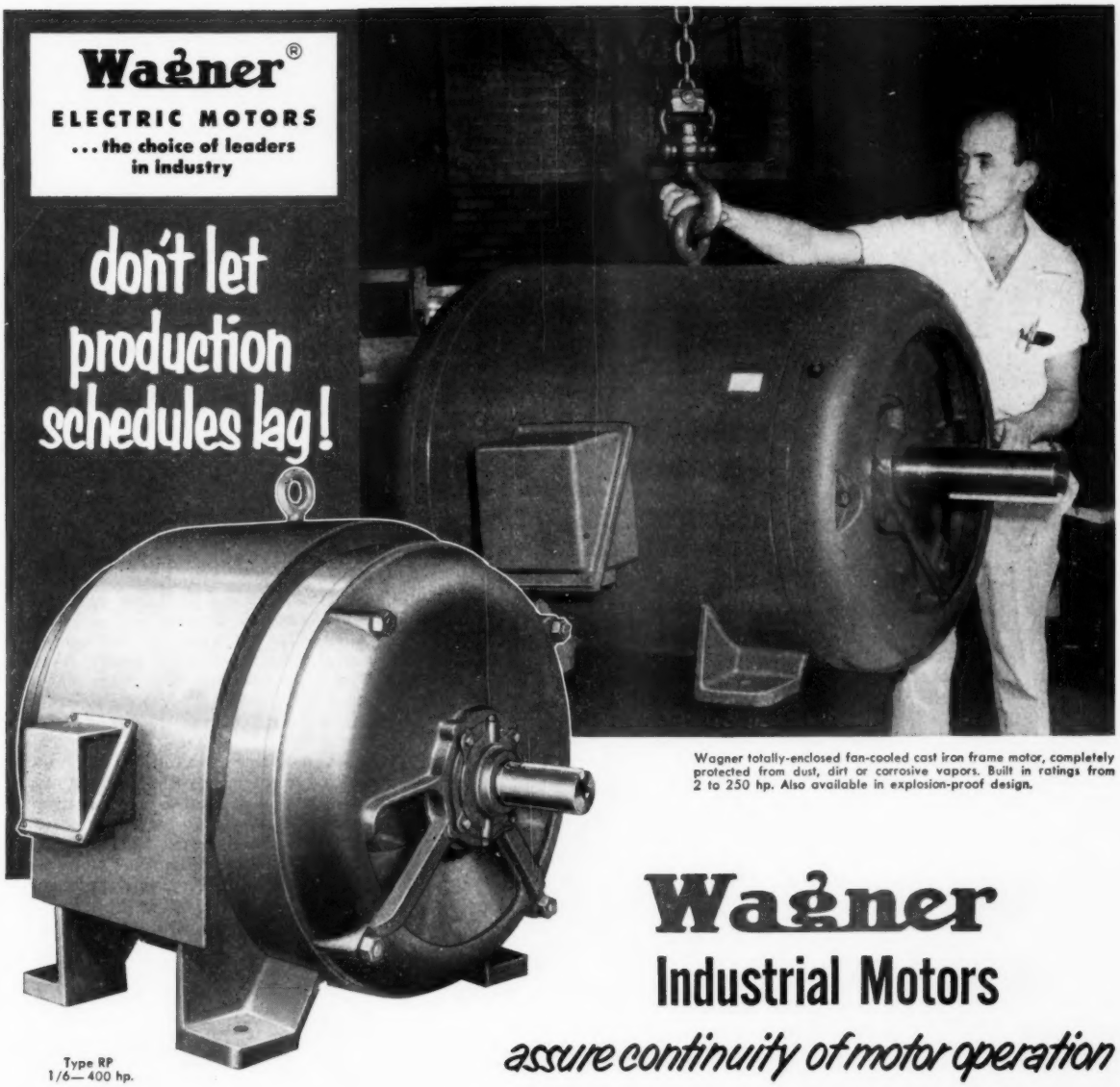

Wagner totally-enclosed fan-cooled cast iron frame motor, completely protected from dust, dirt or corrosive vapors. Built in ratings from 2 to 250 hp. Also available in explosion-proof design.

Type RP
1/6—400 hp.

Wagner Industrial Motors

assure continuity of motor operation

The Wagner line of general-purpose polyphase squirrel-cage motors, built for rugged industrial service, includes a "family" of open protected-type ratings through 400 horsepower. These motors are protected by a heavy steel frame, with ventilating openings at the bottom only, and by endplates of drip-proof design.

These Wagner Motors have the winding strength and the adequate ventilation required to stand the shock of starting heavy loads repeatedly and to operate continuously without exceeding their rated 40° C temperature rise.

* * *

A skilled Wagner engineer will be glad to help you select the correct motor for *your* specific application. Just call the nearest of our 32 branch offices, or write for Bulletin MU-185 for complete information.

Wagner Electric Corporation
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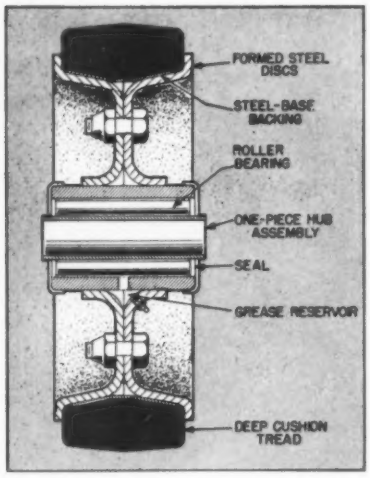
M54-9

For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 32)



Four bolts hold discs of wheel on which tire change can be made in 3 to 5 min.

formed to close tolerances for a precise fit over the wheel discs. Tests under normal plant conditions have shown tires can be changed in a time of 3 to 5 min.

The wheel has a one-piece hub with a retaining ridge that locks the entire assembly to the wheel discs, which, prevents shifting under side thrust. The roller bearings are bathed in grease that feeds from an extra-large reservoir. Felt seals and hardened steel hub caps keep the grease in and dirt and water out.

For high resistance to tear, abrasion and attack from fats, oils, acids and other chemicals the wheels can be equipped with neoprene tires as optional equipment. This gives the new wheels a broad field of economical application in such places as metalworking plants, packing houses, bakeries, textile mills, and chemical plants. *From Neoprene Notebook, published by the Chemicals Div. of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.*

Lightweight Drums

LIGHT WEIGHT and low shipping and production costs are features of non-shattering drums for shipping industrial acids and bulk chemicals.

According to the manufacturer, the drums cost up to 40 per cent less than units made of other materials. Classified as drums by the Interstate Commerce Commission, when shipped in a steel overpack, they are assigned about half of the usual freight tariff assessed regular 13½-gal. glass carboys. They are designed to fit standard fiber, plywood and steel overpacks.

The material is chemically inert and is claimed to resist corrosive action of such powerful industrial acids as muriatic and hydrofluoric, caustic soda solutions and electrolyte fluid.

The drums are resilient, flexing when struck with a sledge hammer. Molded in one piece, they are continuous seamless units 1/16 in. thick in the sidewall and slightly thicker at top and bottom.

The drums have two heavy-duty flanges with standard thread openings to accommodate 2-in. and ¾-in. drum plugs. Flanges are equipped with bottle cap threads on the outer surface which fit regular screw caps.

The Bureau of explosives, which now will issue ICC permits for use of the drums with a steel overpack, is expected to authorize application of the unit with fiber and plywood overpacks shortly. *From a release of Bakelite Co., Division of UCC, New York, N. Y.*

Workman demonstrates the lightness of this large, 55-gallon flexible drum

Electrically Heated Steel

HEATING OF STEEL may be substantially speeded by electricity. A new method of heating was unveiled by West Penn Power Co., Pittsburgh, Pa., and the General Engineering Co. of Toronto, Ontario.

In a demonstration of induction heating, a 1500 lb steel billet, 13 by 13 by 32 in. was heated by electricity to 2,000 F in less than an hour. Conventional methods using gaseous or liquid fuels would have taken five to ten times as long. Electricity consumption was 213 kwhr or 277 kwhr per ton of steel heated. One ton of coal would be consumed to generate the electricity to bring each 6½ tons of steel to rolling temperature by this method.

To generate the heat, standard 60 cycle electricity at 460 v was applied to the coils. This differs from high-frequency induction heating in that no frequency conversion equipment is needed and heat can be induced at a greater depth in the metal.

The 277 kwhr at industrial rates would cost about $2.50 if the power is generated from coal. It is estimated that the induction heating process would save about 60 lb per ton of metal lost by scaling in conventional heating practice. This metal is worth about 5 cents per lb.

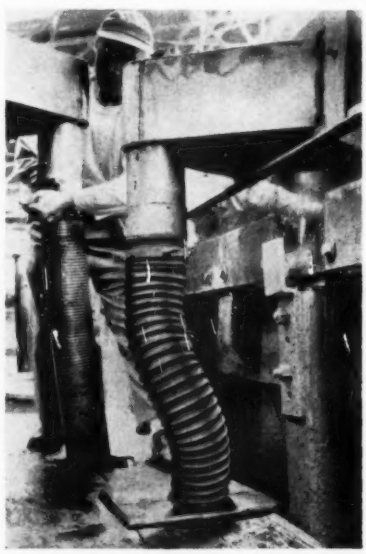
Soaking pits, a major item of cost in conventional practice, would be eliminated. This, plus the reduction in scale loss, and the versatility of fitting induction heating to plant needs, form a favorable climate for future development of this heating method. *From an article in Bituminous Coal Research, published by Bituminous Coal Research, Inc., Pittsburgh, Pa.*

Tubing Resists Corrosion

FLEXIBLE TUBING of neoprene-coated cotton duck, supported by a wire helix, is replacing flexible stainless steel hose for handling corrosive vapors at a large Eastern copper refinery.

The application is fume removal from electrolytic copper refining tanks. The tanks are covered by removable stainless steel hoods, from which connections are made to a fixed fume removal system, to draw off the H_2SO_4 vapors which are formed.

When a tank is taken out of service for removal of the copper, its hood may be shifted to another tank which is ready to go back into service. Thus hoods must fit all tanks. To take care of minor variations in dimensions, connections between



Duct in foreground is neoprene-coated duct; it is of a type used in venting the removable hoods in copper refinery

hoods and the permanent fume removal ducts are made flexible.

Because of the extreme corrosive-

(Continued on page 40)

NEW SOLNUS OILS GIVE YOU MORE LUBRICATION PER DOLLAR

New Multimillion-Dollar Plant Producing Better General Lubricants at Moderate Prices

They can be used for lubrication of plain bearings, antifriction bearings, linkages, slides, cams and gears; in gear boxes, hydraulic systems, circulating systems, industrial diesel engines, compressors.

They can be used for longer periods because they resist oxidation, prevent rusting and corrosion.

They can be applied by every method used in the general lubrication of industrial machinery.

They have low carbon content In compressors, for instance, any carbon that does form is soft and fluffy, is easily blown off, does not build up.

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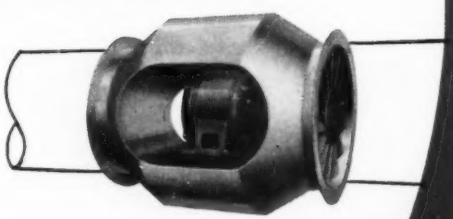
Bifurcator Fans exhaust fumes at *top efficiency* by avoiding a directional change in the air stream. Other fans often require a 90° change in direction of the exhaust stream with resultant loss in efficiency.

The fan motor stays clean, cool and accessible. Fumes are by-passed (bifurcated) around the motor chamber which is completely isolated from the exhaust stream.



Bifurcator Fan installs just like a section of ductwork.

A Bifurcator Fan is easily installed . . . just like a flanged section of ductwork. It can be mounted horizontally, vertically or at an angle. Lightweight and extremely compact, a Bifurcator requires no platform or supports. Bifurcators are available in sizes from 1140 CFM (12" diameter fan with 1/20 HP motor) up to 45,000 CFM (48" diameter fan with 20 HP motor). Housings and fan wheels can be fabricated of non-corrosive metals, or can be protected with a variety of corrosion-resistant coatings.

Be ready with the facts about Bifurcators next time you have a fume removal problem. Fill in and mail the handy coupon below . . . TODAY!

"DESIGN DATA FOR EXHAUST SYSTEMS" This booklet contains practical details, simplified data and charts. Compiled by Allen D. Brandt, Senior Sanitary Engineer, U. S. Public Health Service. Mail coupon for your FREE copy and Bifurcator Bulletin.

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BULLETINS just released and of immediate plant interest

PUMPS, PUMPING

101 **Stainless Steel Pumps**—Catalog 253, about 32 pp in all, is a valuable aid to the proper selection and application of corrosion resistant centrifugal pumps. Provides engineering data, performance curves, capacity charts and other information on stainless steel pumps with a casing construction which permits fast assembly and disassembly. Tri-Clover Machine Co.

102 **For Chemical Feeding**—Twelve-pp Technical Paper 57 discusses the design and operation of controlled volume chemical feed pumps from basic units to specialized models. Complete systems are illustrated to show application of these pumps in pH control, automatic titration and proportional feeding. Discusses new designs and developments, including the Constametric, a positive displacement type pump. Milton Roy Co.

103 **Centrifugal Pumps**—Three types of company's Uni-Built centrifugal pumps with mechanical seal are described and illustrated in 12-pp Bulletin ET-452. Features materials of construction, selection tables, dimensions in inches, and installation, operation and parts list. Bell & Gossett Co.

104 **Controlled Volume Pumps**—Sixteen-pp Bulletin 1053 shows how air-powered controlled volume pumps help solve low-capacity flow control problems. Illustrates pump operating principles; capacity-pressure and air-consumption tables. Gives examples of company's engineered chemical feed systems. Milton Roy Co.

VALVES, PIPE, FITTINGS

105 **Needle Valves**—Twelve-pp Section A presents application and engineering data on needle valves for liquid or vapor service, in types for controlling small volumes through pipe lines and for minute throttling of small flows. Illustrated, gives dimensions, capacities, construction materials. Associated Valve & Engineering Co.

106 **Air Valve**—Eight-pp engineering Bulletin 61861 describes a wobble-rod air valve for on-off control with pneumatic systems. Gives specifications, price data, illustrates application ideas on actuating mechanisms, hook-ups and multiple-valve arrangements. Contains sectional and engineering drawings. Pantex Mfg. Corp.

The Reader Service Card nearby needs no postage. Just circle item numbers of all bulletins wanted. Be sure to include your name, your job title and company name.

107 **Pressure Switches, Valves**—Catalog 3G, 20 pp, describes and pictures company's Shear-Seal valves for manual control of vacuum or pressures up to 6000 psi. Includes four-way, dual pressure selector and shut-off models for pipe sizes up to 1½ in. Contains data on solenoid controlled valves, selector and shut-off for service up to 3000 psi. Air discharge table is included to help determine valve size. Tabulates most useful ranges of diaphragm, bourdon tube, and piston actuated pressure switches. Barksdale Valves.

108 **Glass Pipe, Fittings**—In addition to introducing a new line of sink traps and some new fittings, this 20-pp catalog also lists standard items of stock lengths available. Physical properties of glass pipe that suggest its use for processing industries are discussed, as are ease of cleaning and installation, and economy of operation and maintenance. Technical data and specifications on Pyrex brand spacers, adjustable joints, stock valves, flanges and adapters. Typical glass pipe installations are illustrated. Corning Glass Works.

109 **Aluminum Pipe, Fittings**—Twelve-pp Form AD-197 shows by text and picture where aluminum pipe and fittings are used and why manufacturer's own aluminum pipe offers special advantages. Also lists gases and liquids which can and cannot be safely carried by aluminum pipe, and gives tips on installation. Includes properties of aluminum pipe alloys, dimensional and pressure data. Aluminum Co. of America.

MECHANICAL POWER TRANSMISSION

110 **Transmission Belting**—This 34-pp bulletin on rubber transmission belting describes and illustrates construction features of various industrial belts with sections devoted to oilproof, textile, lumbermill and agricultural belts. Describes method of making the Plylock belt joint, said to eliminate the cause of nearly all belt failures. The B. F. Goodrich Co.

111 **Variable Speed Drives**—Folder 2374 gives detailed information on company's Size 6 P.I.V. (positive, infinitely variable) speed drives, in three types for 20 to 25 hp application. Gives data on basic drive and gear arrangements. Link-Belt Co.

112 **Steel Couplings**—Bulletin 4100, 32 pp, provides engineering data covering the selection and application of company's standard Steelflex couplings. Large cutaway illustration shows construction features of these couplings which are designed to accommodate parallel and angular misalignment and free end float. Photos show industrial installations of these couplings. Book also lists brakewheel, controlled torque, high speed and other couplings for special applications. The Falk Corp.

113 **Needle Bearings**—Catalog 61, 30 pp, describing manufacturer's heavy duty needle bearings, contains helpful selection data. Includes cross-section drawings of typical installations. Lists speed and life factors and capacities; hardness factors; dimensions of bearing assemblies, inner races and housing and shaft fits. The Torrington Co.

114 **Self-Lubricating Bushings**—Eight-pp Bulletin Form 112 discusses company's Graphalloy bushings, designed for strength and high heat dissipating qualities. Also discusses such advantages as durability, no fumes, low and high temperature operation, fire preventive and low coefficient of expansion. Presents engineering data, grades of Graphalloy, physical characteristics. Graphite Metallizing Corp.

115 **Integral-type Motocylinder**—Bulletin B-6090, 8 pp, describes the integral-type Motocylinder for material-handling applications. Describes machine as adaptation of a gearmotor, utilizing a high-torque,

February, 1954

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high-slip electric motor and a short crank on the output shaft to transform rotary to reciprocating motion. Tells how unit can be employed to flip, turn, release, raise or lower material in repetitive cycles. Gives ratings and characteristics, describes operational and maintenance features. Westinghouse Electric Corp.

ELECTRICAL

116 Distribution Regulators—This 12-pp Bulletin 21B7977 gives external and internal features of manufacturer's distribution regulator, Type JFR. Illustrates "Quick-Break" tap-changing mechanism, "Feather-Touch" control and unit construction, gives examples of installations. Lists standard accessories and specifications for regulator in rating of 2,500 v, 100 and 200 amp; 5,000 v, 50 and 100 amp; 7,620 v, 15, 50 and 100 amp; and 14,400 v, 50 and 100 amp. Allis-Chalmers Mfg. Co.

117 Instrument Transformers—Publication GEA-4626G is the 96-pp 1954 edition of this company's "Instrument Transformer Buyer's Guide." Fully illustrated, contains ratings, ASA accuracy classifications, and prices of indoor and outdoor potential and current transformers. Listings of ratio and phase-angle tests, together with tables covering mechanical and thermal limits of current transformers, are included. Available to qualified plant engineers, please state your title. General Electric Co.

118 Outdoor Service Equipment — Designed to facilitate selection of outdoor service equipment, 12-pp Bulletin 2016, describes service entrance, receptacle type, dual control, three-phase units. Typical assemblies of circuit breakers and enclosures are listed. Also included is a guide to company's entire line, giving catalog numbers, hub sizes, voltages, ratings. Bulletin explains hydraulic-magnetic operating principle of manufacturer's circuit breakers, and pictures units available for use in indoor service equipment. Heinemann Electric Co.

119 Sealed Terminals—Six-pp Bulletin 949-A presents, in handy chart form, specifications and data on some 48 types of hermetically sealed terminals. Also included is general information on standard coding system for sealed terminals, on installation method, and on eyelets. Electrical Industries.

MATERIALS HANDLING

120 Conveying Equipment — Sixteen-pp Catalog GC-53 contains photos, specifications and application suggestions on portable and permanent-type belt units, gravity wheel and roller conveyors in steel and lightweight aluminum, and industrial casters and hand trucks. Shows how this conveying equipment can be used as separate units, or combined to fit individual handling problems. The Rapids-Standard Co., Inc.

121 Electric Hoists—Described and illustrated in 8-pp Bulletin P1534B are electric hoists with lifting capacities from ¼ to 1½ tons. Cutaways show construction details of both chain type and wire rope type hoists and 12 major features are explained in detail. Dimensional data and prices are included. Advantages of these hoists, as described, are light weight, push-button control, fast lifting action. The Yale & Towne Mfg. Co.

122 Grips for Safe Handling—Bulletin 200B, 24 pp, pictures and gives ordering and application information on hooks, tongs, grips and slings. Covers their use with a wide range of materials, including steel plates, pipe and round bar stock, drums and barrels, coils, cartons, baled material, timbers. Also lists chain pocket wheels and guides. Includes current price sheet. Downs Crane & Hoist Co.

123 Hoisting Equipment — Sixteen-pp bulletin describes and gives specifications on manufacturer's gas, electric and hand powered derricks, winches, and elevating and hoisting equipment. Provides motor data, including chart for proper wire size and length of extension cords needed. Sasgen Derrick Co.

124 Power Shovels, Cranes—Form 155-8303, 24 pp, covers crawler-mounted power shovels and cranes in company's 1-yd Lorain 50 series. Illustrated text explains leading features of the line. There are also operating views of the cranes, shovels, hoes, clamshells and draglines and sections devoted to each of these five interchangeable front ends. The Thew Shovel Co.

CONSTRUCTION AND MAINTENANCE

125 Metal Building Units—Fundamental advantages of manufacturer's standard steel buildings and data on them are presented in 24-pp Bulletin BC-521. Describes rigid frame, truss type and Tite-Loc buildings, as well as special types. Construction details are illustrated as are typical installations. Includes specifications, data on accessories. The Steelcraft Mfg. Co.

126 Considering Glass Blocks?—Catalog GB-101, 24 pp, discusses glass blocks for industrial, commercial and public buildings. Covers physical performance, technical data on light transmission, insulation values, accessory materials. Pictorial description helps selection of proper functional pattern. Pittsburgh Corning Corp.

127 Rolling Doors—Power or manually operated rolling doors are described in illustrated Bulletin 301. Besides general information covering construction of these doors, booklet provides detailed data on fire doors, grilles, counter doors, specialty doors. The Cookson Co.

128 Protection Against Rust—This bulletin describes and gives application data for Z.R.C., a coating applied to iron and steel to provide a dried film protective coating of 93 to 95 per cent pure zinc. The Sealube Co.

129 Protective Coatings — Prepared in outline form, this newly revised catalog provides facts on protective coatings and their applications. The use of company's Magic-Vulc to repair conveyor belts and to protect equipment from corrosion and abrasion is described. A list of Magic-Vulc coatings and their uses is included. Magic Chemical Co.

130 Vacuum Cleaning Equipment—Vacuum cleaning units to suit requirements for commercial buildings, industrial plants and buildings where noise is objectionable are listed in illustrated Bulletin 152. Also shown are furnace cleaners, units for emptying sump tanks, belt-drive units and special units. The Spencer Turbine Co.

WATER TREATING

131 Ion Exchange—This 16-pp illustrated bulletin relates ion exchange technology to familiar examples. Two-color drawings show fundamental processes. Lists 13 process types including water conditioning, removal of metal ion contaminants, recovery of metallic ions. Resinous Products Div., Rohm & Haas Co.

132 Water Treating Phosphate — Bulletin 66, 32 pp, presents the properties and

(Continued on page 147)

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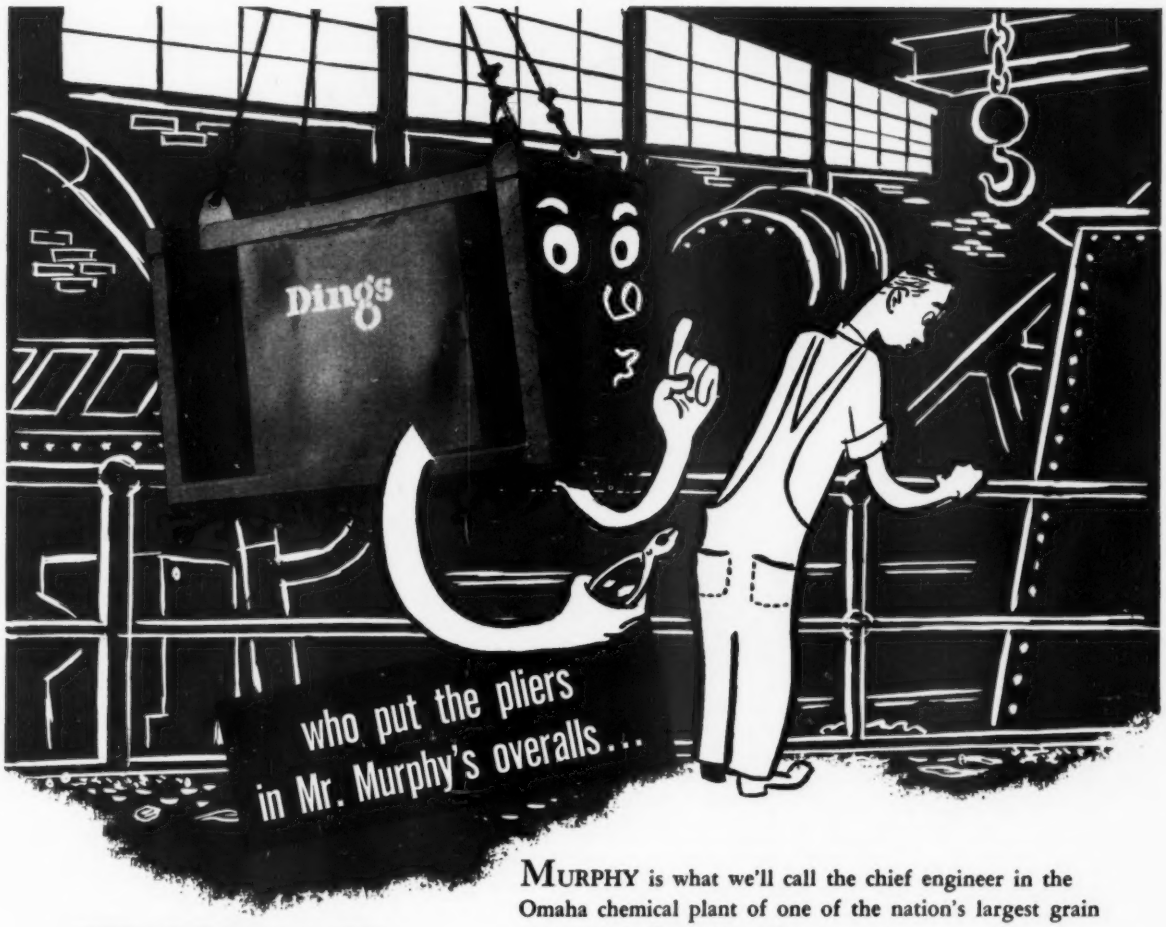
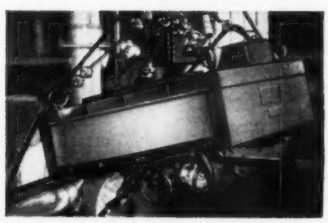


MURPHY is what we'll call the chief engineer in the Omaha chemical plant of one of the nation's largest grain processors.* Here's his story —

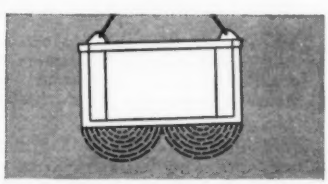
One day, not long after his Dings RM Suspended Tramp Iron Magnet was installed, he was wishing he had a pair of long nosed pliers. Shortly after, one of his men walked up and handed him a pair. They'd been pulled out of a 12-inch conveyor belt burden of corncobs by the Dings RM Magnet.

Murphy was awfully glad to see those pliers and not just because he wanted a pair. He was thinking of what they would have done to the hammermills and other processing equipment fed by that conveyor, if they hadn't been caught by the Dings Magnet.

You might think about that, too. What's it costing you to "process" tramp iron in your plant? It isn't necessary. Your Dings representative can show you an economical way to eliminate tramp iron with a Dings Magnetic Separator.



THIS IS THE MAGNET THAT CAUGHT THE PLIERS — That junk on the bottom is a typical tramp iron accumulation— crushed "tin" cans, wire. "Murphy" reports even crowbars occasionally find their way into the corncobs processed in his plant.



HERE'S HOW IT WORKS — The Dings RM Magnet can be suspended over conveyor belts, installed on chutes or liquid lines. There isn't a more powerful tramp iron magnet than this triple-poled unit. Its field is deeper and longer, and it's available in a complete range of sizes and magnetic strengths. Complete details in Catalog 1315-A.

*Name and complete details on request

DINGS MAGNETIC SEPARATOR COMPANY

4766 W. Electric Ave., Milwaukee 46, Wis.

RM-154

Dings

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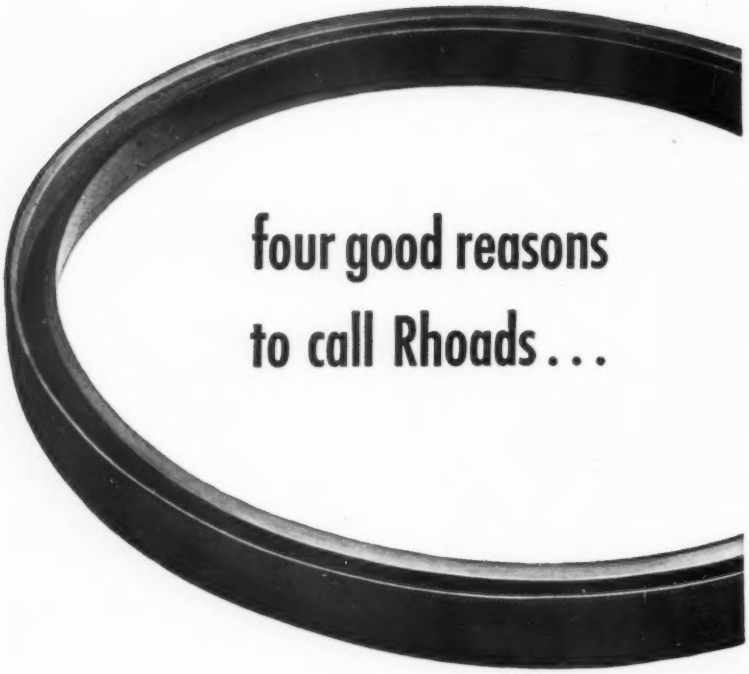

four good reasons
to call Rhoads . . .

when you need leather packings*

1. **They're job engineered from start to finish** by Rhoads engineers. Rhoads Tannate Leather Packings provide an effective seal against glycerin, alcohol, mineral, fish and animal oils . . . water, vegetable or any other non-caustic, non-acid fluid. They will not cold flow and will not score or abrade the most highly finished surface.

2. **They're made from specially tanned leather** to give them a low coefficient of friction, and build up desirable product characteristics to meet your exact requirements.

3. **They're custom impregnated** for operation ranging from a few ounces pressure to many thousands of pounds psi. Tannate packings can be made rock hard or flexible to meet your requirements.

4. **They're precision molded and accurately finished** to fit snug against shafts and cylinder walls. The exacting dimensions to which Tannate packings are manufactured insures a leak-proof seal.

* Available as U, Vee Cup and Flange leathers for hydraulic and pneumatic equipment.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 32)

ness of the fumes, Type 316 stainless steel is used for hoods and ducts. In heavy gages, it withstands the acid attack for long periods. Formerly, Type 316 flexible articulated metal hose was also used for the flexible connections. But because of the high military demand for nickel-bearing alloys, Type 316 flexible hose has not been readily available. Other types of stainless steel hose were easier to obtain, but in the thin gages necessary to retain flexibility, they didn't last long.

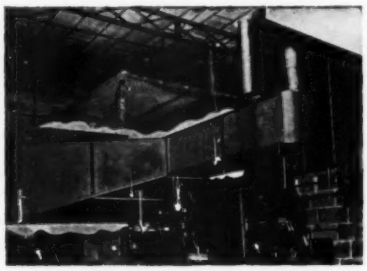
It was decided to turn to Spiratube R. This is a lightweight, highly flexible tubing made of neoprene-impregnated cotton duck, spirally wound on a wire helix.

The heavy coating of neoprene makes the tubing highly resistant to attack by the acid fumes. Its flexibility, and the abrasion resistance of its coating enables it to give long service despite the frequent making and breaking of joints. Small breaks in the tube wall can be repaired with a patching kit. *From a release by Flexible Tubing Corporation, Guilford, Conn.*

Window to Heater to Booths

LOCATION OF PAINT SPRAY booths which are used in the manufacturing process presented an air supply problem in the Tri-State Molding Co. plant of Henderson, Kentucky.

Two booths were situated in one



Cutaway through partition screen shows ductwork from former window opening leading to units; exhaust stacks are seen in upper right corner

room and were equipped with standard spray booth fans. This means, of course, that sufficient air had to be furnished to balance that exhausted. Unfortunately the paint room was located so that no direct outside source of air could be used.

No room was available for conventional centrifugal fans and indirect gas-fired heating sections. Neither could air from the plant be used without creating a serious vacuum problem.

So, to provide the lowest cost and

INSTALL WIREWAYS FASTER!

SQUARE D's NEW AND EXCLUSIVE *Lay-in Duct*

FASTER ASSEMBLY!
LESS NUTS AND BOLTS
FASTER WIRING!
NO MORE THREADING OR PULLING OF CONDUCTORS...JUST LAY THEM IN
FASTER HANGING!
UNIVERSAL TYPE HANGERS
FASTER GANGING!
KNOCKOUTS MATCH THOSE ON RELATED SQUARE D EQUIPMENT. NO CONDUIT BENDING

Square D's exclusive design provides hinged covers for both the duct sections and connectors. Easily removable fitting covers then provide a completely unobstructed wireway in which to lay wires.

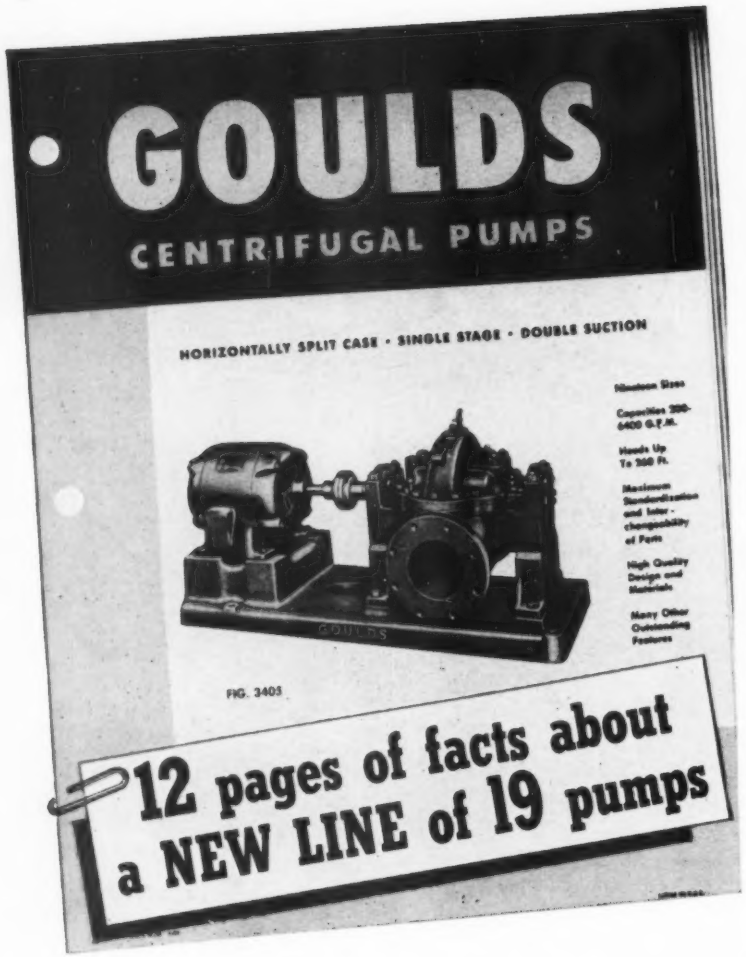
LAY-IN DUCT is available in 2½" x 2½", 4" x 4", and 6" x 6" sizes, in standard lengths of 1, 2, and 5 feet. There is a complete line of fittings, all with the "lay-in" design feature.

• • •

Write for the complete story of **LAY-IN DUCT**—how it gives you a better wireway system, easier, faster and at less cost. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY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CENTRIFUGAL PUMPS
HORIZONTALLY SPLIT CASE • SINGLE STAGE • DOUBLE SUCTION
FIG. 3405
12 pages of facts about
a NEW LINE of 19 pumps

The quickest way you can really discover what the new Goulds Fig. 3405 centrifugal pump can do for you is to read the descriptive bulletin pictured above.

Here are some hints of what you'll find:

The quality of materials and extras of design that you have been able to get only by paying extra are *standard* on this new pump: stuffing box bushings, stainless steel impeller keys, Teflon water seal rings —to mention a few.

The Fig. 3405 carries interchangeability of parts far beyond anything we've been able to do before. Only three shaft and rotating parts assemblies (exclusive of impellers and wearing rings) provide for 19 pump sizes.

This means real spare parts inventory savings for any plant that uses many pumps. It also means easy-to-make field changes to meet new requirements.

We've come as close as modern design and materials allow to putting into this new pump what our industrial customers have told us they want. The 12-page illustrated bulletin tells you all about it. We'll be glad to send you a copy.

To get a copy of Bulletin 721.6, get in touch with the nearest Goulds representative or just fill in the coupon, pin it to your letterhead and mail it to us at your convenience.

GOULDS PUMPS, INC.
Dept. PL, Seneca Falls, N.Y.
Please send me 12-page information Bulletin No. 721.6 on the new Fig. 3405 centrifugal pump.

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Company_____

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Goulds PUMPS INC. Seneca Falls New York

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PLANT ENGINEERS' DIGEST

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most suitable supply of make-up air, a large window serving an area near the spray room was utilized. A bank of filters replaced the glass. A sheet metal enclosure was constructed to form a duct from the window opening to the plenum.

Since natural gas was available, a series of four unit heaters was installed with the inlet side of the units in the plenum. Other ducts connected the outlets of the gas units to the openings cut into the wall of the paint room. To finish off the job, air outlets to the paint room were covered with all-metal filters.

The fan capacity of the gas unit heaters was selected so that the combined air input to the paint room was a little more than the air exhausted from the spray booth fans. *From Trane Weather Magic, published by the Trane Company, La Crosse, Wisconsin.*

Aluminum Plating Tips

ELECTROPLATING on aluminum offers many advantages and is entirely practicable when using proper baths and techniques. The chemical activity of aluminum is greatly affected by alloying constituents, so plating practices are modified somewhat for each alloy classification.

Being very active chemically, aluminum may be attacked by certain plating solutions. It also tends to replace more negative metals from their solutions, forming non-adherent immersion deposits of these metals on the surface.

Electro-deposits on aluminum must be continuous, because any voids in the cathodic metals generally plated on aluminum make the base metal susceptible to localized galvanic corrosion.

The sodium zincate or zinc immersion process at present is the accepted commercial process for electroplating on aluminum. ASTM specification B 253-51 T covers it.

When immersed in a solution containing zinc salts, aluminum will replace the zinc in solution causing deposition of a thin film of metallic zinc on its surface. The quality of subsequent electro-deposits depends upon obtaining a uniform deposit.

Proper cleaning and pre-treatment of the aluminum surface is necessary. The natural oxide film and the micro-constituents formed in alloying are removed in alkaline and/or acid pickling solutions, producing a thin oxide film having the uniform surface activity necessary for a uniform tight zinc deposit.

The zinc immersion bath recommended in ASTM B 253-51 T consists of 70 oz. per gallon of sodium

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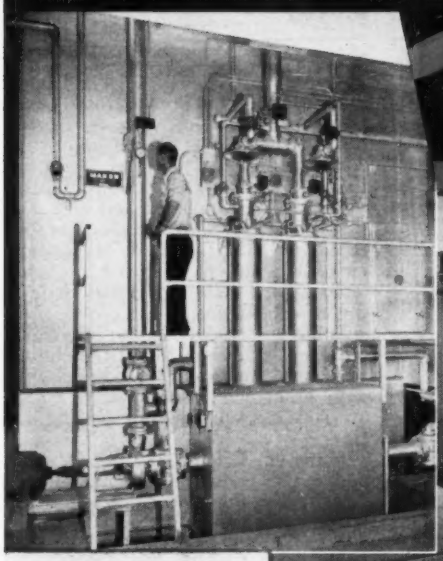
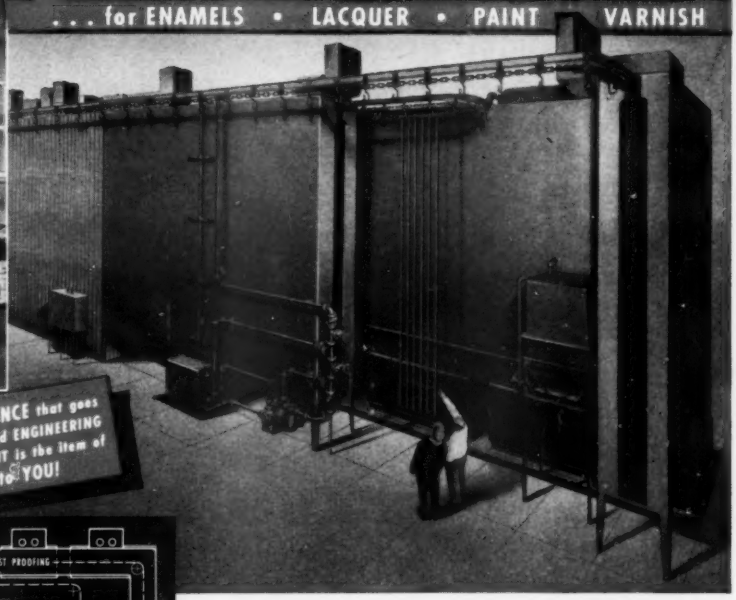
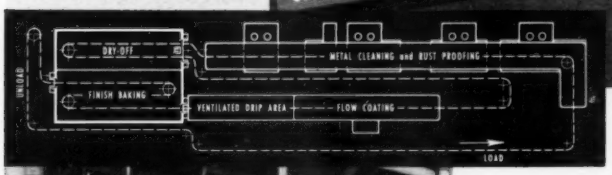
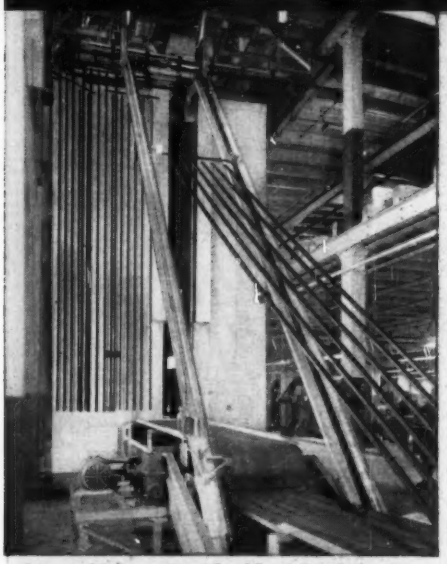


Mahon FIRE-JET Heating Units on the solution tanks of Mahon Five-Stage Metal Cleaning and Rust Proofing Machine—part of the Complete Mahon Finishing System at MULT-A-FRAME Division of Ainsworth Manufacturing Corporation, Detroit, Mich.



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!





Exit end of Mahon combined Dry-Off and Finish Baking Oven showing Automatic Unloading Conveyor Ramp and Belt Type Handling Conveyors on the first floor at the Ainsworth Plant.

Ainsworth MULT-A-FRAME Channels are Painted in MAHON EQUIPMENT!

When the MULT-A-FRAME Division of Ainsworth Manufacturing Corporation was confronted with a finishing problem, they turned to Mahon for the solution. The product is a box channel 20 ft. long with only a ½" slot in one side—these are cleaned, rust proofed and painted outside and inside. Two hundred channels are finished per hour. Thousands of Fittings, Concrete Inserts and other MULT-A-FRAME parts and accessories are also finished on the same line. The finishing equipment extends from a pit in the first floor to the second floor ceiling. Oven Heating Units, Recirculating Fans and Exhaust Fans are located on the third floor. Automatic loaders and unloaders, with ramp conveyors from the first floor, load and unload the main conveyor which is located 27'-5" above the first floor. This is another Complete Mahon Finishing System designed and built by Mahon to do a specific job efficiently and economically. If you have a finishing problem, or are contemplating new finishing equipment, you will find that Mahon engineers are better qualified to advise you on both methods and equipment requirements . . . better qualified to do the all-important planning and engineering of equipment—which is the key to fine finishes at minimum cost. You will also find that Mahon equipment is built better for more economical operation over a longer period of time. Mahon's background history in this highly specialized field covers thousands of Complete Finishing Systems including Dip, Flow Coating and Spray Equipment for every conceivable product painted on a production basis. See Sweet's Plant Engineering File, or write for Catalog A-654.

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HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

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MAHON

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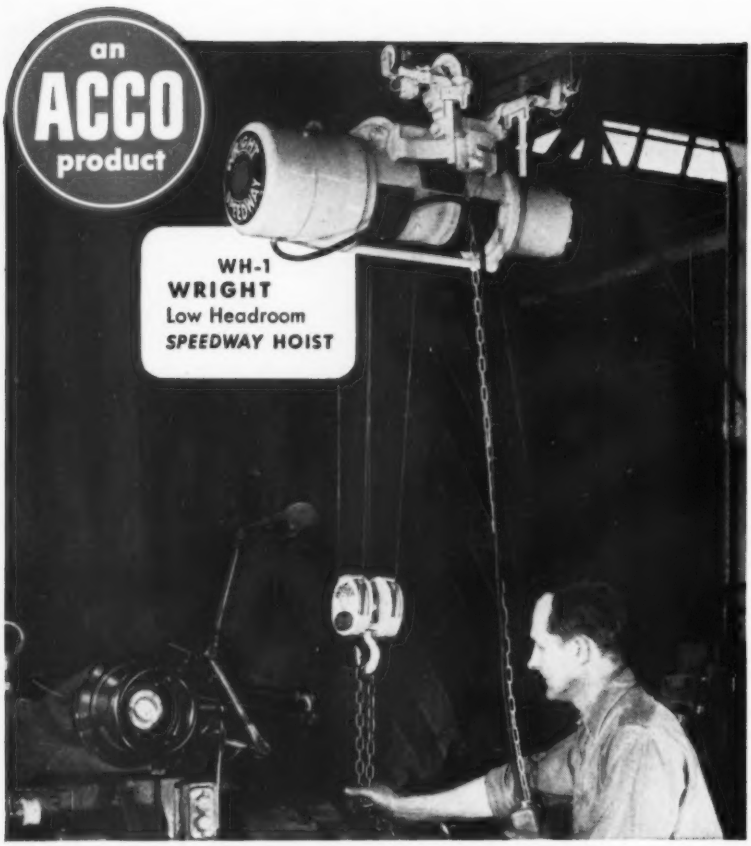

Is Hoist Headroom a Headache for You?

• Look at this. The bearing point of the hook of this **WH-1** Low Headroom WRIGHT *Speedway* Hoist can be raised so it is only 12¼ inches below the beam. And this is a 1-ton hoist with the five key features that make WRIGHT *Speedways* last longer and require less servicing.

This hoist has heat-treated and surface-hardened alloy steel gears, hard alloy silver electrical contacts in controller, heavy duty crane type safety limit stop, automatic multiple disc load brake, and ball bearing gear shafts.

Add to this grooved cable drums, improved plow steel preformed cable, concealed motor wiring, completely enclosed and ventilated weatherproofed housing, etc., and you'll have a combination of features found only in the WRIGHT *Speedway* Hoist.

Best of all—WRIGHT *Speedways* are priced no higher than ordinary hoists. In the long run they'll cost you less.
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hydroxide (commercial grade) and 13 oz. per gallon zinc oxide (technical grade). Due to the high viscosity and alkalinity of the zinc bath, thorough rinsing is important and losses due to drag-out are high.

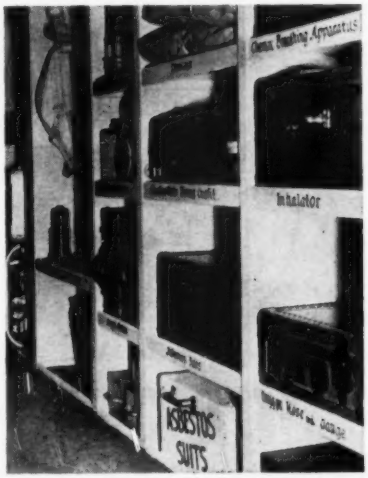
If the rate of zinc deposition is too rapid, the zinc film may be spongy and non-adherent. Holding the bath temperature below 80 F will reduce the rate of deposit.

Following the deposition of a thin, uniform, adherent film of metallic zinc, the aluminum can be plated with other metals for which there are suitable solutions for plating on zinc.

While nickel, chromium, silver, and other metals can be plated directly over the zinc film, a copper strike is recommended prior to their deposit. *From Reynolds Metals Technical Advisor, published by Reynolds Metals Company, Louisville, Kentucky.*

Industrial Emergency Unit

TODAY INDUSTRY finds many new problems in maintaining an effective safety program and must, therefore, follow new avenues of



Unit carries emergency items in marked compartments for easy identification

protection. Many old safety practices are now obsolete. New and synthetic materials have come into use: some paints, glue and plastics may cause explosions, asphyxiation and fire.

What is the use of thousands of dollars worth of safety equipment, if it is not almost instantly available for rescue work, fire-fighting or first aid? Placing protective and safety material near supposedly hazardous spots is no longer found adequate.

Who knows where an emergency might occur? When a life is at stake, precious minutes may be lost getting the right pieces of equipment to the scene because it was kept in the wrong spot.

At the Higgins, Inc., plant and shipyard in New Orleans, Louisiana, an emergency unit, which is an innovation in industrial safety equipment, has been developed. In the extensiveness of its equipment and its speedy availability, this unit far exceeds those of many municipalities, hospitals and industrial plants.

An old bus which was used to transport workers to the plant during World War II has been converted almost magically into an efficient and speedy means of transporting and handling safety, rescue, first aid and fire equipment. Its seats were torn out. Then, with measurements figured to a degree of expertness, every available inch of space was used to build bins, racks and shelves—each made to hold its own particular piece of equipment and labeled so that no time is lost in finding needed articles. The company's entire variety of emergency equipment is at hand with the arrival of this truck! And that includes 472 pieces.

The truck responds to all fire alarms and all ambulance calls, unless the injury reported indicates it is not needed. At times the unit responds to emergency calls outside of the company property.

This mobile safety unit has been viewed by insurance representatives, fire chiefs, army and navy personnel, civil defense executives and labor leaders. All were enthusiastic in their praise of the amount and type of equipment and the procedure developed to handle it. *From a Mine Safety Appliances Company release, Pittsburgh, Pa.*

Inert Gas Welding Processes

DEVELOPMENT of two major inert-gas arc welding processes is in line with the increasing industrial use of mass production equipment and procedures. The flux-free methods used with stainless steel not only offer unprecedented welding speeds for manual applications but also are easily adaptable to machines and fully automatic setups. One is used on sheets; the other is employed on plates.

The non-consuming electrode method using an inert gas-shielded tungsten arc is suitable on light gage jobs. Peak efficiency with this process is usually on work 0.125 in. and under. Where filler metal is required, welding may be done in a manner similar to that used with the oxyacetylene torch. Accessory elements are available for the automatic introduction of filler wire into the arc, in manual as well as in machine and automatic operations.

When the non-consuming elec-

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These and dozens of other industrial services are readily controlled by Rockwell-Nordstrom lubricant-sealed valves. These valves use lubricant, not only for easier turning and longer life free from abrasion, but also as a leak-proof seal. Write for catalog with service recommendations. All sizes, for any piping arrangement, iron, steel and corrosion-resistant alloys.

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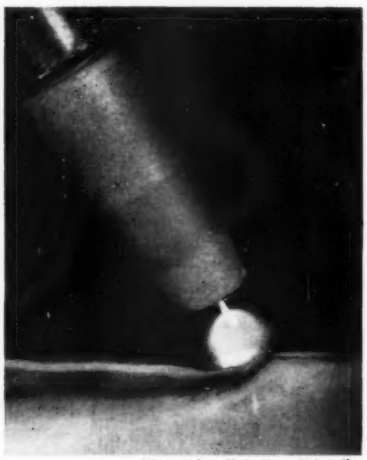

Photo: Air Reduction Sales Co.

Non-consuming gas-shielded tungsten arc is shown being used on stainless

trode process was first introduced commercially for the fabrication of stainless steel, it had the answer for most of the welding problems. The flux-free welding minimized the risk of inclusions in the welds. There was no spatter to clean up. The heat affected zone was narrow. It made possible a deposit of a bead of controlled height and extreme smoothness.

Reputedly the most significant welding development in recent years is the inert-gas shielded metal arc process because of the production advantages inherent in its use. Wherever stainless steel is welded in heavier than sheet thicknesses, 0.250 in. and above, the process can be used economically. Welding speeds available with the method are far greater than those obtainable with the tungsten arc. A bare wire electrode is fed from a coil within the inert-gas shield in manual, machine and fully automatic applications.

Welds made by this process are free from slag and flux. Interpass cleaning is eliminated when two or more beads are required. This saves time and assures that the weld will be free of inclusions that may lessen its strength or corrosion resistance. *From Steel Horizons, published by Allegheny Ludlum Steel Corp., Pittsburgh, Pa.*

Plastic Marking Operation

IT IS NOT always the most complex component of a product that is a bottleneck in operation. And so it was at Nash-Kelvinator's Milwaukee plant.

In this case, the problem concerned

NEXT TIME...ORDER SCOTTISSUE TOWELS!

1. They drink up water like a thirsty camel.
2. They're strong — even when soaking wet.
3. They're so soft that many people use them as face cloths.
4. They're clean and white — of course.
5. They're double-fold to dry double-quick.

JUST ONE SCOTTISSUE TOWEL DOES THE JOB!

ScotTissue Towels have an exceptionally high fiber content. This "bulk," plus generous size and double fold, make a case of 3,750 ScotTissue Towels weigh 46 lbs.* Some paper towels cost less for 3,750 but are 10 to 20 lbs. lighter*— hence less drying power. Write for more facts. Scott Paper Company, Dept. PE-5, Chester, Pa.

*Shipping weight

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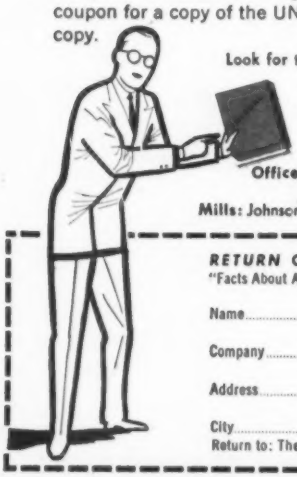

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PLANT ENGINEERS' DIGEST

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the marking of plastic control knobs. Using hypodermic needles, girls tediously filled letters and numerals in the cast knobs, wiping off the excess paint.

After some work on the problem, the company engineers took off on a new approach. They turned from fully-molded knobs to molded plastic blanks, which later would have the markings machine-embossed and marked automatically.

Operator is in process of placing plastic blank in die. Marked knob can be seen as it is about to be ejected into drum

In the changeover from manual operation to an automatic one, a hydraulic press was put to use. It was equipped with a hydraulic index table and foil marking device. The foil marker is mounted directly on the press ram and automatically feeds foil at each stroke. The table operates with the ram cycle, since its power is derived from the press' hydraulic system.

The molded knobs are placed in a hopper at the left side of the six-station index table and hand-fed into the key-slotted dies. The keyway insures uniform relative marking of the dials.

After being embossed and marked, a cam-riser at the first station past the ram lifts the parts from its seat. At the next station, a cam-actuated air blast blows the finished piece into an off-bearing chute.

The new hydraulic press method now makes 800 parts per hour with only one operator needed. Six different jobs are handled on this one press with no rejects due to uneveness of marking or fill. Tooling is readily changed by merely removing a pair of bolts on each die set. *From the Denison Press, published by the Denison Engineering Co., Columbus, Ohio.*

Before you buy unit heaters... steam, hot water or gas...

SEE MODINE FIRST!

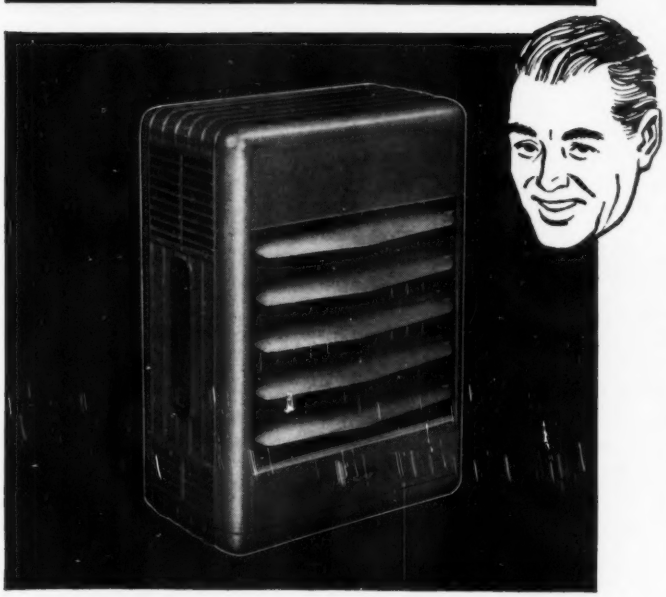
"MODINE STEAM AND HOT WATER UNITS ASSURE PERFECT HEATING COMFORT AT LOW OVERALL COST"

ALL Modine steam and hot water unit heaters have discharge air temperatures of 110 to 120° F. correctly related to air velocities. This is the key to balanced heating plus lower fuel costs. And it's just one of the big plus values you get when you specify Modine.

Consider the new Modine Vertical. Rugged, durable construction results in longer life. Yet a major reduction in weight and bulk means important savings in installed cost. The largest model (2540 Edr) weighs only 284 pounds.

Modine horizontal delivery units can be suspended directly from overhead piping without other supports. Simple, attractive styling fits any commercial or industrial application.

Yes, for long years of efficient, trouble-free unit heating, see Modine first! Call the Modine representative listed in your classified phone book, or write for Bulletin 153 on Modine Steam and Hot Water Unit Heaters.



"MODINE GAS-FIRED UNITS ARE ONLY HALF THE WEIGHT, HALF THE SIZE OF THE AVERAGE OF 7 OTHER LEADING MAKES"

ONLY Modine Gas-Fired Unit Heaters are built with both *stainless steel* heat exchangers and burners. With no need for special structural supports on these lighter weight, more compact units, installation costs are far lower. On one job, it cost the heating contractor $600 less to install 66 Modines than conventional units—savings he passed on to the owner.

Equally important, this stainless steel design resists corrosion. The individually fired tubes heat uniformly. And you get maximum combustion efficiency because the burners have elongated ports with four times the free area of ordinary drilled ports. Remember: with Modines, you are *sure* of getting full rated capacity.

As a leader in steam and hot water unit heating for more than 25 years, Modine brings unequalled experience to gas unit heating problems. For complete data, ask for Bulletin 653. Modine Mfg. Co., 1563 DeKoven Ave., Racine, Wis.

Modine
UNIT HEATERS

U1218

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Handclasp of a friend-in-need

There's confidence in the very "feel" of the world famous C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers. The quick-acting "Squeez-Grip" fits your hand naturally like a handclasp... hangs right... carries right... works right. You're in complete command of the situation instantly... no fumbling... no fatigue.

From the non-conducting, shatterproof discharge horn to the high strength, durably finished cylinder, you get top quality construction that results in a lifetime of satisfactory service. Because of the very few working parts and corrosion resistant materials throughout, the total cost to you over the years is less than other initially lower priced makes... fire after fire, recharge after recharge, without trouble.

It's not hard to see, when you fully compare and try, why C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers are your best buy for killing flammable liquid and electrical fires, as well as some surface fires involving ordinary combustible materials. Sizes range all the way from 2½ to 100 pounds capacity... all fully approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories, Armed Forces and Government Bureaus.

With C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers the penetrating carbon dioxide is a clean, dry, non-damaging, non-conducting, inert gas... smothers fire instantly, leaves no after fire mess... harmless to equipment, materials and finishes... even food is still perfectly edible.

Act now for complete free information on these first-rate, sure-acting fire extinguishers. Remember fire doesn't wait ...get the facts today!

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Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

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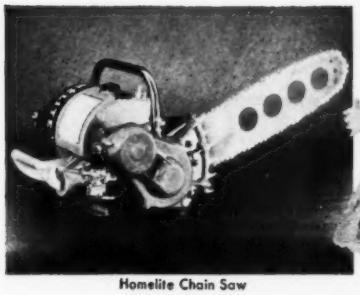
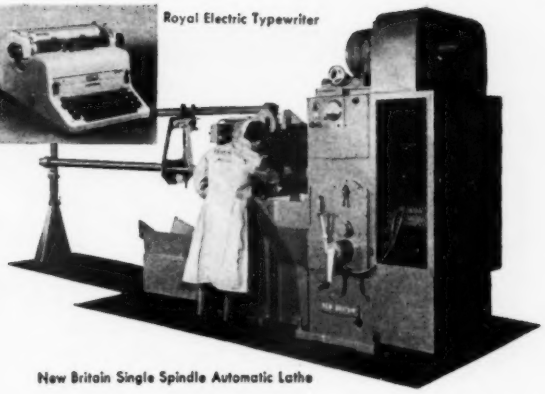


Homelite Chain Saw

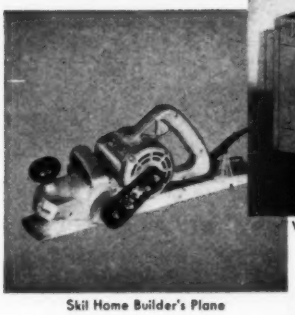
Winnie, the Walking-Talking Doll

Royal Electric Typewriter



New Britain Single Spindle Automatic Lathe

From mechanical dolls to giant machine tools, these products have one thing in common*

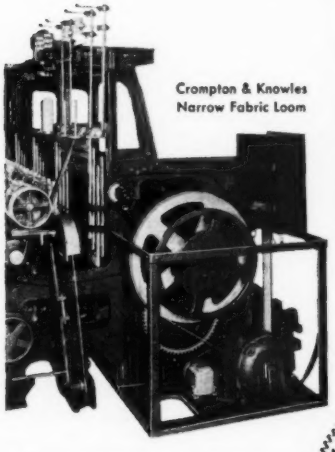


Skil Home Builder's Plane

Wade Precision Tool Room Lathe

Clarke Floor Sander

Van Norman Radial Grinder



Crompton & Knowles Narrow Fabric Loom

*Gilmer "Timing"® Belt Drives

WHY have leading manufacturers chosen this revolutionary toothed belt in preference to V-belts, flat belts, gears and chain for the *main drives* in these and scores of other products? Why have they already used millions of these versatile drives, definitely establishing the Gilmer "Timing" Belt Drive as *industry's new power transmission medium?*

A few reasons: This drive can't slip . . . needs no lubrication, initial tension or take-up . . . provides compact, high-ratio speed reduction...saves power...cuts costs! Stock drives available through NYB&P distributors. Ask for completely descriptive Gilmer "Timing" Belt Stock Drives Manual.

NYB&P

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America's Oldest Manufacturer of Industrial Rubber Products

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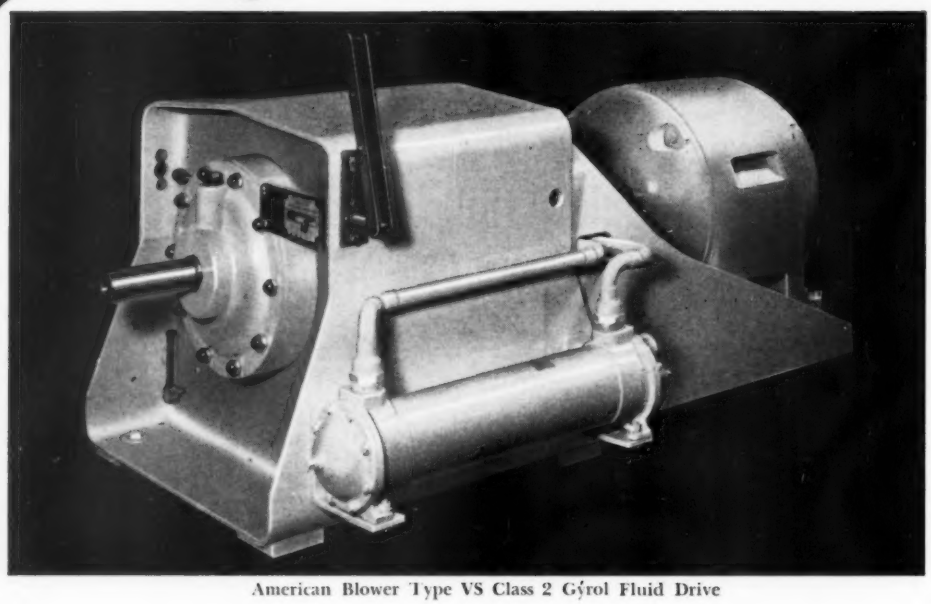
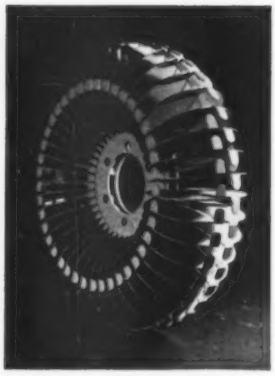
ANNOUNCING THE NEW AMERICAN BLOWER

Gýrol FLUID DRIVE

TYPE VS CLASS 2



American Blower Type VS Class 2 Gýrol Fluid Drive



A phantom view of the driving and driven members, which provide smooth, reversible power transmission.

- **Can be reversed while in motion at any variable operating speed by merely reversing direction of rotation of motor**
- **Permits adjustable speed control over a wide range**
- **Built in several standard arrangements**

HERE IT IS! A brand-new fluid drive that will help you solve many tough industrial-drive problems. It's the American Blower Type VS Class 2 Gýrol Fluid Drive. A compact, self-contained, adjustable speed unit.

The result of years of development and research, this adjustable-speed fluid coupling is crammed with features. It has unlimited application possibilities, with its wide-range, stepless speed, reversible control. Even on constant-torque loads, a 4-to-1 speed range is obtainable!

It permits driving motors to reach full-load speed before engaging the load. In many cases simple across-the-line starting may be used. Adjustable speed may be obtained by either automatic or manual adjustment of the speed-control lever.

The new Type VS Class 2 Gýrol Fluid Drive is available in six sizes . . . 7½ through 800 h.p., at normal motor speeds up to 1800 r.p.m. Built in five standard arrangements, it can be used on a wide variety of industrial applications.

For complete information about the Gýrol Fluid Drive line, give your nearest American Blower Branch Office a call, or write us direct for free literature.

For smaller applications the Type TM Constant Speed Gýrol Fluid Drive is available in ratings from 1 to 20 h.p.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

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At its Burlington, New Jersey, plant...

Rheem Manufacturing Company

uses just one grease

for all applications involving high load, high speed, water hazard and wide temperature variations

"IT'S SHELL ALVANIA GREASE"

THE Burlington plant contains many giant presses, heavy production equipment and hundreds of secondary tools. All of this equipment is lubricated with a single multi-purpose grease . . . Shell Alvania.

Shell Alvania Grease is bringing outstanding machine protection and lubrication economy to plants from coast to coast. It is a true multi-purpose grease . . . shows remarkable indifference to heat, cold, water and machine speeds. In plant after plant, Shell Alvania Grease serves *every grease application* in the production setup!

ADVANTAGES OF SHELL ALVANIA GREASE:

1. **Shell Alvania Grease flows *freely* in cold temperatures, yet will not run out of bearings under excessive heat.**
2. **Ideal for wet, humid applications . . . it resists water emulsification.**
3. **Shell Alvania Grease has extremely high oxidation stability.**
4. **You'll find that Shell Alvania Grease extends time between greasings . . . a substantial saving in labor and grease.**
5. **Simple inventory . . . just the one grease to stock and apply.**

Why not let us show you how Shell Alvania Grease can save time and money in your plant. Write for technical information to Industrial Lubricants, Shell Oil Company, 50 West 50th Street, New York 20, N.Y.— or 100 Bush Street, San Francisco 6, California.

SHELL ALVANIA GREASE

The True Multi-Purpose Industrial Grease

For more facts circle 546 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Fire Extinguishers Aweigh

REDUCING A THREE-DAY JOB by 2½ days is the accomplishment of Fred Proud, maintenance employee at

Suggestor Proud demonstrates method of weighing fire extinguishers on scales

Food Machinery and Chemical Corp.'s Ordnance Division.

Weighing 209 fire extinguishers once each week, to check for carbon dioxide leakage, was done on a platform scale, carried from one extinguisher station to the next on a fork lift truck. In addition to this being a cumbersome job, lasting three days, it required full-time use of the lift truck.

The weighing procedure now takes only four hours, using a lightweight hanging scale. The employee responsible for checking the extinguishers merely walks from one station to the next, hanging each extinguisher on the scale. The extinguisher bracket provides a convenient hook from which the scale is hung.

Tips on Titanium

PRACTICAL MACHINING information on titanium and its alloys is rather scarce, and one bit of this information already has been disproved—the metal and its alloys do not work harden easily.

As part of an effort to provide industry with a few pointers, Carboloy Department of General Electric Co., Detroit, reports tool failure on all tools is generally due to excessive cratering on top of the tool. Use of a proper grade of cemented carbide can reduce this, although the low modulus of elasticity of titanium may cause chatter or vibration of a loosely-supported workpiece.

One remedy for vibration is to hone a 45-deg land on the cutting edge, 0.005 in. to 0.010 in. wide. If this fails, reducing the feed may remove the vibration.

As hardness of work material rises above Rockwell 37, tool life may be expected to fall sharply. Also, carbon content over 0.2 per cent reduces tool life because of titanium carbide formation.

The use of coolants of the synthetic emulsion type coolants is recommended, with complete flooding of the tool, from top, sides and bottom.

One of the most important factors in machining titanium is the composition of the metal—commercially pure or alloyed. Alloys such as Ti-140A and RC-130B contain about 8 per cent alloying elements; com-

(Continued on page 56)

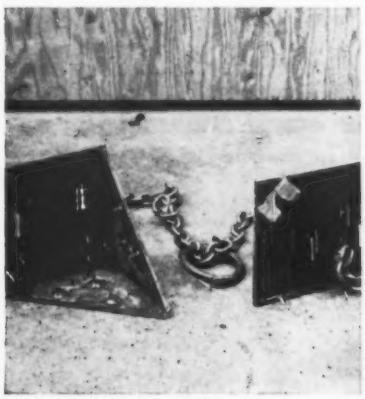
Chain Harness for Crates Helps Fork Truck Make a Long Lift

HANDLING LONG CRATES presents an acute problem to the Temco Aircraft Corp., Dallas, Texas, particularly since many of the aircraft components which they manufacture are from 20 ft to 30 ft in length. Jockeying these crates on a lift truck, picking them up in the center of their long axis, is difficult, and often dangerous to personnel involved.

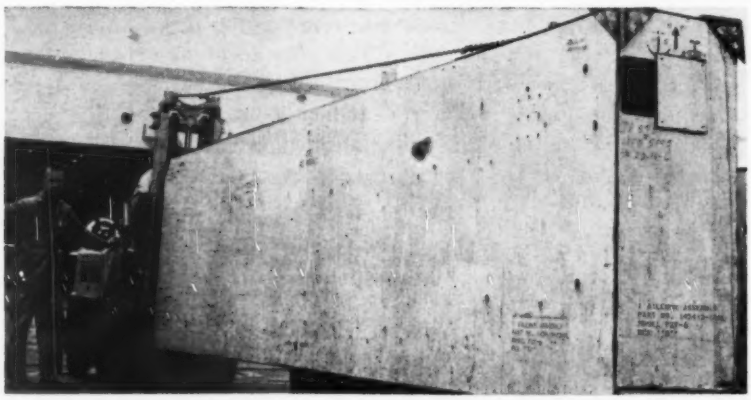
Shipping inspector J. R. Yarborough of Temco designed a harness to facilitate handling these long crates from one end. Two steel corners, fabricated from plate and joined together by a length of ¾-in. chain, support the outer end of a crate as the opposite end is raised on the forks of the lifting truck.

To move a crate with the harness, the truck operator runs the forks under one end of the crate and hangs the steel harness on the outer, upper corners of the crate. Pointed metal studs welded inside the corners bite into the crate for a sure grip, which improves as the weight of the crate forces them deeper into the wood. A length of chain is stretched from the top of the fork truck mast to the chain tying the two corners together. As the truck forks are tilted back, the chain tightens and lifts the end of the crate furthest from the truck.

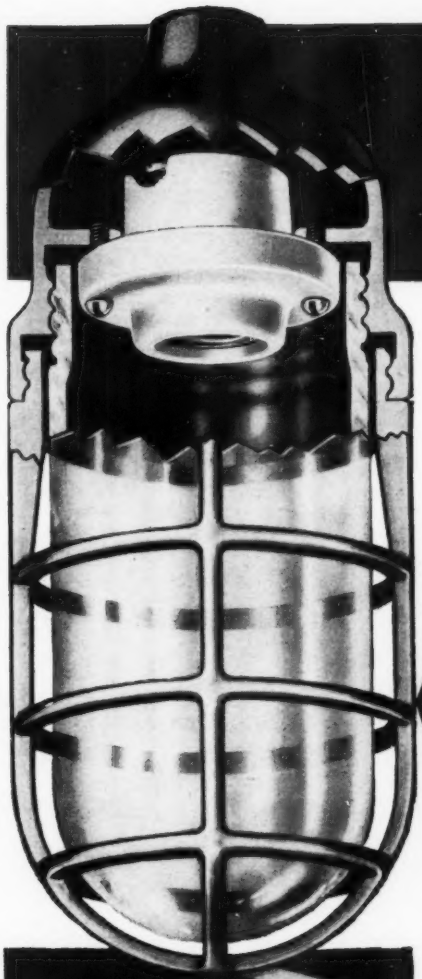
One-man handling of these bulky crates is now possible. Injury to personnel and damage to crates during handling has been minimized.



Steel corners with welded-in gripping spikes are chained to form harness



Long narrow crate containing aircraft component is spotted handily on loading dock by fork truck equipped with chain "boom." Steel corners grip outer end



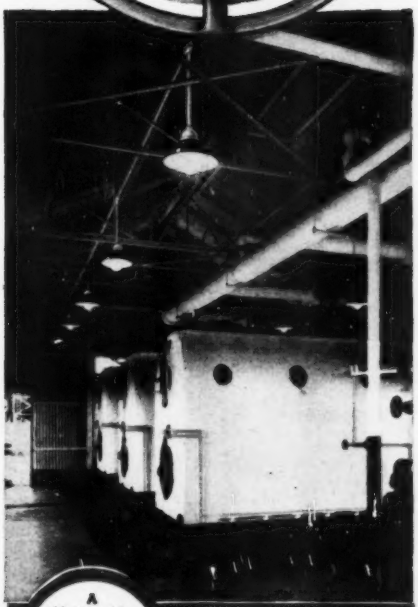
CROUSE-HINDS

Vaportight

Industrial Lighting Fixtures

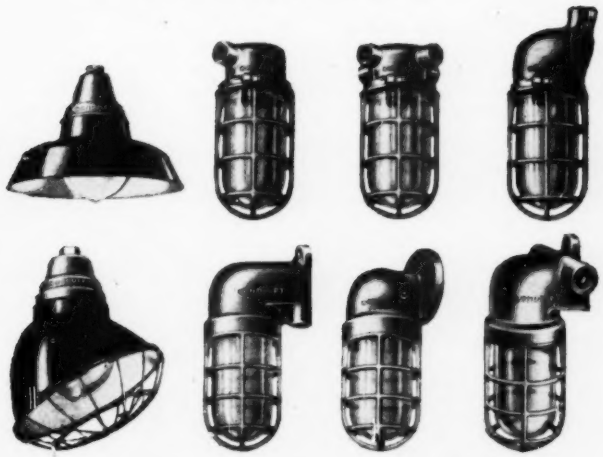
For use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, non-explosive vapors and gases, or non-combustible dusts.

1. **Vaportight** and raintight.
2. **Wiring chamber** remains vaportight even though globe is off.
3. **Porcelain Receptacle.**
4. **Screw guard** or clamp guard.
5. **11 Hub** arrangements.
6. **4 Reflector** styles.
7. **Accessories:** Colored globes, pear-shaped globes and guards, half shades, and adapters.
8. **4 Sizes:** 50 through 500-Watt.



***Vaportight* lighting fixtures are available for attaching to several round-base Condulets and sheet steel outlet boxes. Crouse-Hinds complete *Vaportight* line includes hand lamps, switches, plug receptacles, and other electrical devices.**

Complete listings in the Condulet Catalog.



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OPERATION—PRODUCTION

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mercially pure titanium such as Ti-75A contains about 1 per cent impurities.

For machining titanium alloy forgings with cemented carbides, select carbides similar to grade 44A or special grade 55A. The former should provide good tool life on the oxide scale, the latter works well on more severe cases. In this instance, tools should have as large a nose radius as possible, but kept to a minimum to reduce chatter. The tool should be run about 50 fpm with 0.010-in. to 0.020-in. feed and ¼-in. to ½-in. depth of cut.

For cuts deeper than ½ in. on irregular cast ingots, use a shear type tool with 40-deg negative back rake, 15-deg positive side rake, 15-deg side cutting edge angle and 7-deg relief.

If no scale is involved in semi-roughing, a cemented carbide grade similar to 883 provides fair tool life at speeds of 150 fpm to 200 fpm, feeds from 0.010 in. to 0.020 in. per revolution and ⅛-in. to ¼-in. depth of cut. Successful tool designs for this application are: 0-deg back rake, 5-deg to 7-deg side rake, 45-deg side cutting edge angle, 5-deg end cutting edge angle, 0-1/64-in. nose radius and 10-deg relief on side and end; a triangular insert with ⅜-in. or ½-in. inscribed circle; or a round insert with ½-in diameter.

For finish turning, boring and facing, use a round or triangular insert tool, carbide grade 883, with negative side rake angle, 0.005-in. to 0.010-in. feed per revolution and 1/64-in. to 1/32-in. depth of cut.

Good tool life in milling titanium alloy is obtained with grade 883 at approximately 350 fpm using 0.003-in. feed per tooth on a climb face milling operation. No coolant is recommended. Use 0-deg rake angle and a 45-deg lead angle with a sharp nose.

When machining commercially pure titanium, use the same tools, grades of carbides, feeds and coolants as for titanium alloys — but speeds should be about doubled.

Tubing Enters Rotary Straightener "In Motion" To Speed Production

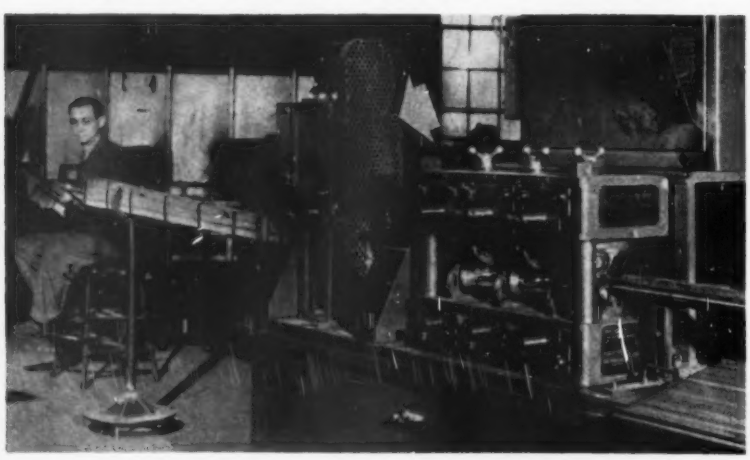
To MEET stringent customer specifications—less than commercial deviation from perfect straightness, with minimum surface imperfections on ½-in. alloy tubing—Metal Forming Corp., Elkhart, Indiana, uses a Mackintosh-Hemphill rotary straightener, equipped with a modified feed arrangement.

The six-driven-roll machine straightens nickel-chrome alloy tube for electric range heating elements, with diameters that vary from 5/16 in. to ½ in., and wall thicknesses of 0.020 in. to 0.030 in.

One plant engineering development by the company has considerably increased the production rate. A "spinner feed" augments the machine feed, with the result that each tube is rapidly spinning as it enters the straightener.

Lengths of tubing are inserted in a wooden run-in box by the operator, who sits about 8 ft from the machine. As the tube exits from the box, it enters a 1-in. steel pipe, lined with rubber. This pipe, actually the spinner, spins the tubing up to the speed of the straightener before it enters the rotary machine.

This innovation not only expedites the tube straightening but also has minimized galling of the tube ends, usually caused by the impact of the tube hitting the first set of straightener rolls. The spinner is equipped with a variable speed control, so that it may be synchronized with any speed of the straightener.



As operator feeds tubing into run-in box, spinner drive (arrow) turns rubber-lined sleeve to set tubing in rotary motion before it enters straightener rolls

Worn Reamers Become Broaches

REWORKING of scrapped reamers with chipped or worn flutes has given Temco Aircraft Corp., Dallas, Texas, a maximum return on its reamer investment, as well as a new source of draw broaches.

The reworking process is based on proposals by two Temco supervisors —one to make broaches with spiral threads rather than the conventional circular threads, the other to use scrapped reamers as stock for the broaches.

First of two major steps in producing the broaches from reamers is grinding of the reamer to desired broach size on a cylindrical grinder. Also on the cylindrical grinder, the reamer shank is formed to fit the broaching machine adapter.

Transformation from reamer (top) to broach requires four hours' machine time

Second step is thread grinding, done on standard thread grinders. The broaches are ground with four leads, pitched two threads to the inch. Each lead has a 45-deg secondary land to provide shaving clearance, and a 7-deg primary land, the cutting edge. The leads are similar to the Buttress thread used on firearms, since the pressure in both instances comes from only one direction.

The salvaged reamer is ground to a 0.001 in. per in. taper, with the last inch of length untapered to impart a burnishing action to the broach. Broaches which have been fabricated at Temco range in size from ⅜ in. to 1¼ in.

Pressure Gage Protects Drills

NOVEL APPLICATION of a pressure gage provides a means of cutting production costs caused by drill and tap breakage in drill press operations.

It is of particular value where quantity repetitive work is done, and

telling the story of 'dag' dispersions

Here is a Heat-Proof Dry-Film Lubricant

It's 'dag' colloidal graphite. It comes dispersed in a variety of liquid carriers . . . water, oils, volatile hydrocarbons, resin-solvent combinations . . . which get it where it should go, and then put it to work.

Spray it on, paint it on, apply it by dipping. 'dag' colloidal graphite produces a durable, *dry lubricating film* that won't gum up or break down at any of the temperatures you are likely to run into. It is unaffected by heat up to 750°F. . . . with a coefficient of friction so low that moving parts just keep on moving.

'dag' colloidal graphite works where conventional lubricants have failed . . . on oven conveyors, in bearings of kiln-car wheels, on conveying equipment for hot strip steel, and in places where degreasers destroy most lubricants . . . almost everywhere that high heat and friction must be licked to keep things going.

Let 'dag' colloidal graphite dispersions cure these headaches for you. Details are available in Bulletins No. 424-B-O and No. 435-B-O.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

dag DISPERSIONS

Acheson Colloids Company, Port Huron, Mich.

. . . also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

Units of Acheson Industries, Inc.

try resin-bonded dry graphite films for permanent lubrication

Safer than Slippery Flooring

A matador is aware of the risks in his job but because SLIPPERY FLOORS GIVE NO WARNING—often look safe—workmen can be killed or hurt before they know *their* danger! A practical remedy is A. W. SUPER-DIAMOND—tough, rolled-steel floor plate with an exclusive, engineered raised-diamond surface. SUPER-DIAMOND puts 40 anti-slip traction points in every footstep—gives maximum foot safety at low cost. Investigate SUPER-DIAMOND for accident prevention. Write for new Booklet SD-5.

A.W. SUPER-DIAMOND

Economy Rolled Steel Floor Plate

ALAN WOOD STEEL COMPANY

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Other Products: A.W. ALGRIP Abrasive Rolled Steel Floor Plate Plates • Sheet • Strip • (Alloy and Special Grades)

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OPERATION—PRODUCTION

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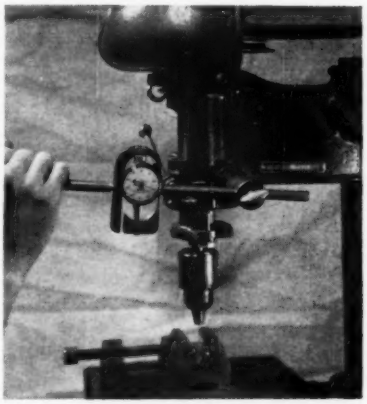


Pressure gage inserted in drill press handle shows amount of leverage used

where the smaller sizes of taps and drills are used. These smaller sizes are particularly susceptible to breakage by excessive downward pressure.

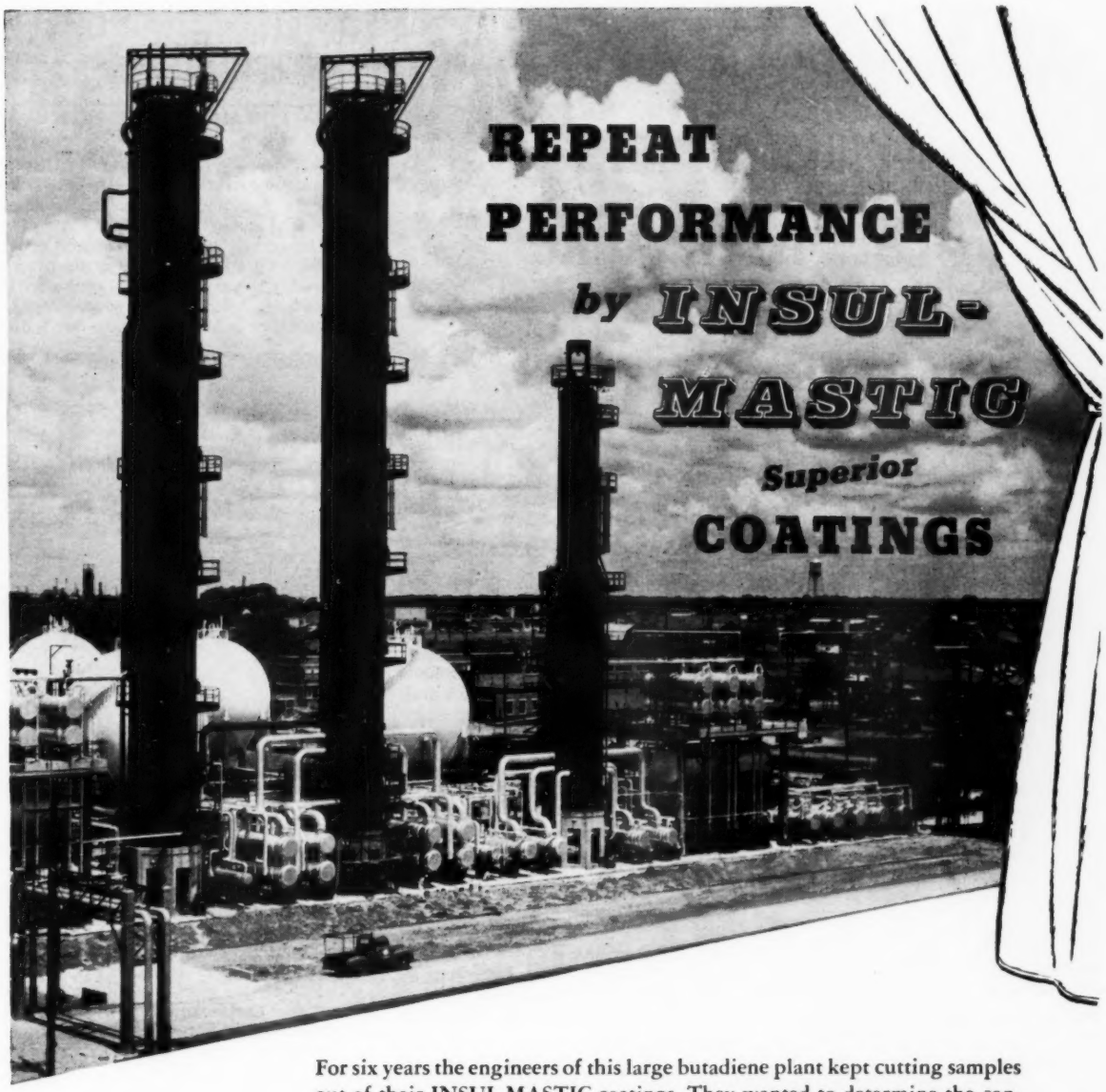
In use, the regular drill handle is removed and a split handle inserted with the pressure gage forming part of the handle. The gage, made by W. C. Dillon & Co., Van Nuys, Calif., measures pressure in pounds, and maximum safe pressures for operations can be determined by trial. After the maxima are determined, breakage from excessive pressure can be avoided by keeping leverage below the established maximum for each operation.

Pre-Coated Coil Stock Puts the Finish First

PRODUCTION INCREASES of more than 100 per cent have followed the introduction of pre-coated coil steel as a raw material at Bright Star Industries, Clifton, N. J.

Manufacturers of flashlight batteries and cases, photoflash and industrial battery cases, Bright Star uses pre-coated coil steel in its fabricating presses. They have found that the coil offers several advantages, among them faster production time. Time savings are produced by eliminating slitting of the stock (formerly inventoried as pre-coated sheet) and use of automatic coil feed on the stamping and punching presses. Switching from pre-coated sheet to pre-coated coils increased Bright Star's battery cap production from 40,000 to 85,000 units per day.

Lower inventory also is possible with the coil. Supplied with a different color on each side of the metal, the same coil can be used for different colored battery tops. Coiled



For six years the engineers of this large butadiene plant kept cutting samples out of their INSUL-MASTIC coatings. They wanted to determine the condition of the metal or insulation underneath. What they found was so satisfactory that INSUL-MASTIC was specified when the three new towers above were built. It takes excellent results to command a repeat performance from such critics.

Protect your vessels, Vaporseal your insulation with INSUL-MASTIC coatings. For many long years they will halt weather, acids, alkalis, moisture vapor and other causes of corrosion.

What INSUL-MASTIC has done in the plant above has been repeated in hundreds of plants. Specify *proven* protection. Specify INSUL-MASTIC *Superior* coatings.

Use INSUL-MASTIC Type "D" for insulation and corrosion up to 250°F. Our technical engineers are available to help you with this and other coating specifications.

Think *first* of the coatings that *last!*

Insul-Mastic

CORPORATION OF AMERICA

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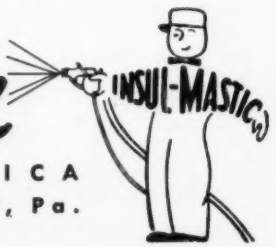


Representatives in Principal Cities

For more facts circle 550 on Reply Card

All Air-Cooled Dry-Type Transformers Are NOT Alike

This was proved by tests, comparisons and experiences

THAT there is a difference in dry-type transformers was revealed in the findings of a survey made by PLANT ENGINEERING, a trade publication, which mailed 500 questionnaires to users of dry-type transformers. (A copy of this report will be sent on request.)

Most of the users who returned questionnaires reported having very favorable experiences with air-cooled dry-type transformers. A number of unfavorable reports listed the following reasons: "Some makes won't even handle their rating." "Some are very noisy." "Primary shorts." "The insulation breaks down without overload in relatively short time." Some recommended "mounted lugs for connections."

The unfavorable comments above *do not apply* to Sorgel air-cooled dry-type transformers.

SORGEL air-cooled dry-type transformers are guaranteed to carry the full rated load continuously, and are so liberally designed that they can safely carry an overload during an emergency. They are well known for their quiet operation. All are equipped with solderless terminal lugs.

Because these superior features cost more to incorporate in Sorgel air-cooled transformers, our price may not always be the lowest; however, the little additional price you might sometimes pay will be saved several times over in extra service and lower installation costs. We spare nothing to maintain the highest quality in air-cooled dry-type transformers.

SORGEL air-cooled dry-type transformers are top quality, time-tested, and are therefore recognized and accepted by discriminating engineers and users.

These transformers are available in a large variety of sizes and types for every purpose. ¼ Kva to 1,000 Kva single phase. 1 Kva to 3,000 Kva 3-phase. All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltages.

SORGEL dry-type transformers are also incorporated in substations, complete with primary and secondary switch gear.

The Sorgel Electric Co. has had over 35 years of uninterrupted experience in the development, manufacturing and application of dry-type transformers.

Stock carried in the following cities:

Chicago, Illinois
Cleveland, Ohio
Los Angeles, Calif.
Milwaukee, Wis.
Rock Island, Illinois
Rockford, Illinois
Richmond, Indiana
Davenport, Iowa
Cedar Rapids, Iowa
Omaha, Nebraska
Roxbury, Mass.

Consult the classified section of your telephone directory or communicate with

SORGEL ELECTRIC CO.

844 West National Ave., Milwaukee 4, Wis.

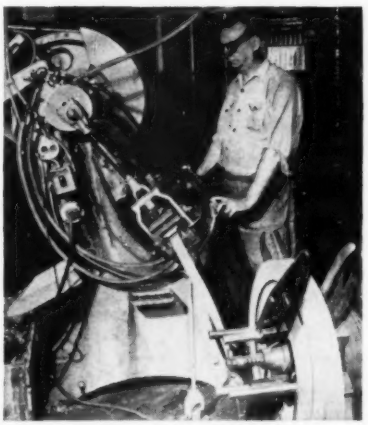
For more facts circle 551 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

steel also minimizes scrap losses formerly experienced, since the coils can be supplied to exact width and end loss is negligible.

Depending upon the size and type of battery, the battery caps are made in red, gold, or black for quick identification, with red predominating. Two types of coil are used—one with



Operator controls stamping press as pre-coated coil stock feeds continuously

red and gold coated sides, and the other with red and black coated sides. Either coil can therefore be used for production of red caps and when gold or black caps are required, the operator has only to feed the coil into the press with the other side up.

Pre-coated metal, which was developed and is supplied by Enamelstrip Corporation, Allentown, Pa., is also used by Bright Star in the fabrication of tubes for flashlight cases, and for telephone battery containers.

In making the flashlight tubes, the pre-coated coil stock is first blanked, then embossed to form hand-grip corrugations, rolled and finally the two edges are joined with a lock seam to form the tube. Despite this series of stresses, the paint adheres to the metal firmly. The finish is bonded to the metal with a phosphatizing process to permit stamping, piercing, intricate embossing and drawing without damage.

Woodworking Production Line

Contributed by H. B. McDermid

INSTALLATION of a "production line" in a woodworking shop was instrumental in reducing manhours at a molder almost 50 per cent.

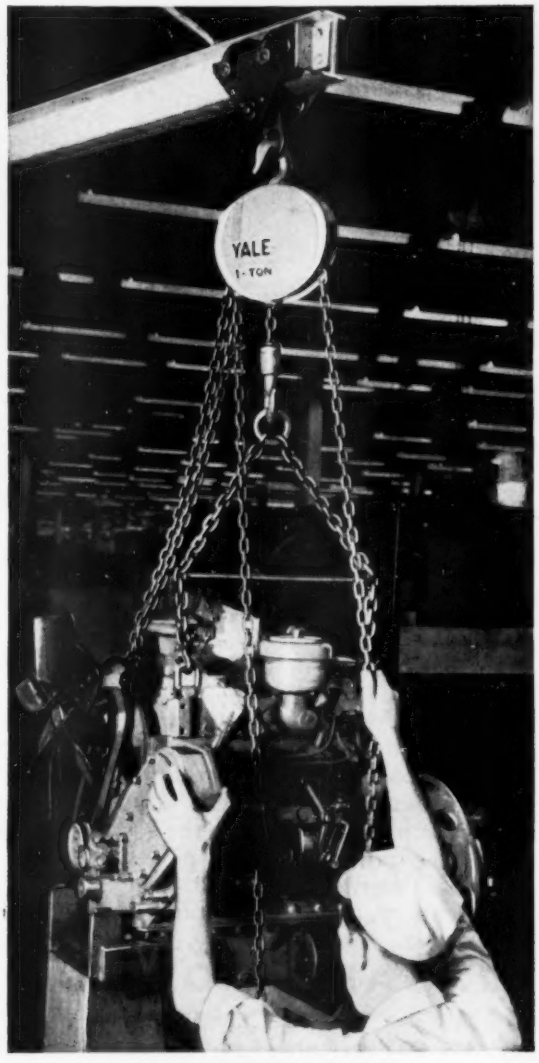
Prior to the installation, each woodworking machine required the services of two men—a feeder to

Lifts more . . . lasts longer . . . costs less to service and maintain

THE YALE LOAD KING HAND HOIST IS TRULY THE FINEST OF ITS TYPE

QUICK FACTS ABOUT THE LOAD KING HAND HOIST

Capacities ½ to 2 tons
Lightweight...easily portable
Quality aluminum alloy castings and alloy steels throughout
Fast . . . lifts 4000 lbs. 2.1 ft. in 60 seconds
One-piece housing protects all operating parts
Precision ball bearings on all rotating shafts
Exclusive Synchro-Matic Load Brake automatically keeps load suspended between pulls
Fractureproof steel Safety Hooks



Here's an aluminum-alloy Hand Hoist that delivers up to 95% mechanical efficiency! It's really lightweight . . . the half-ton model is only 36 lbs. . . . can safely and easily be moved and operated by one man.

Like all YALE Hoists, the Load King Hand Hoist is sold only through your local Industrial Distributor. Let him help you select the Hoist you need for safe, sure, easy handling. He's a fully qualified lifting expert.

The 1-ton Load King Hand Hoist shown at right is lifting a bulky motor block smoothly, swiftly, safely.

YALE*

INDUSTRIAL TRUCKS AND HOISTS

*Reg. U. S. Pat. Off.

MAIL THIS COUPON TODAY

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Roosevelt Boulevard, Phila. 15, Pa.

Please send me my FREE copy of the *Yale Hoist Users and Buyers Guide.*

Company_____

Name_____ Title_____

Street_____ City_____ State_____

In Canada write: The Yale & Towne Manufacturing Company
St. Catharines, Ontario, Canada

Gas, Electric, Diesel & LP-Gas Industrial Trucks • *Worksavers* • Hand Trucks • Hand & Electric Hoists • Pul-Lifts

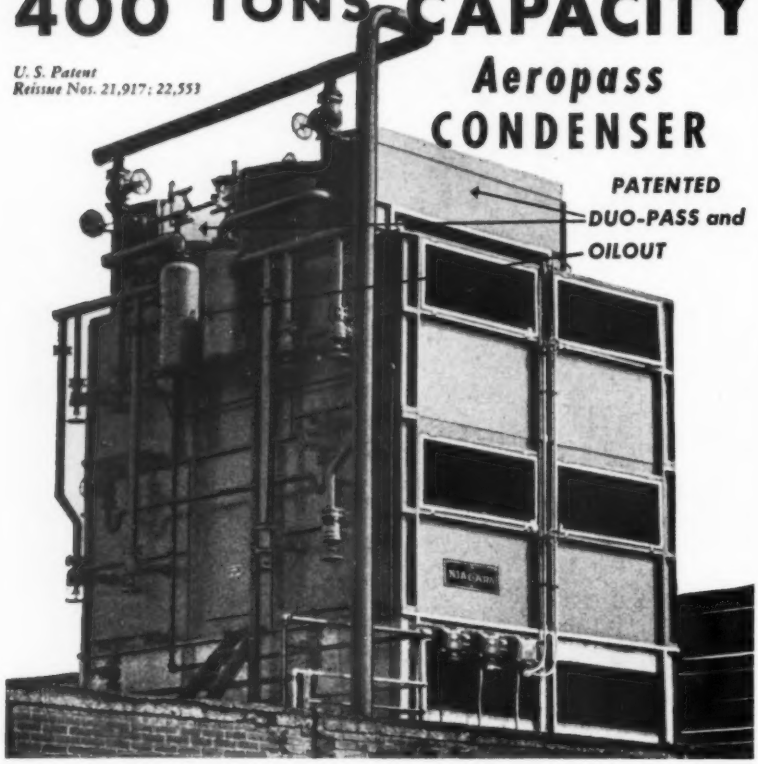
For more facts circle 552 on Reply Card

400 TONS CAPACITY

U. S. Patent Reissue Nos. 21,917; 22,553

Aeropass CONDENSER

PATENTED DUO-PASS and OILOUT



YOU USE LESS POWER...
SAVE CONDENSER WATER...
SAVE UPKEEP COST

For large refrigeration systems, NIAGARA gives you a choice between a battery of condensers (that may be cut on or off with the load) or a high capacity condenser that saves space.

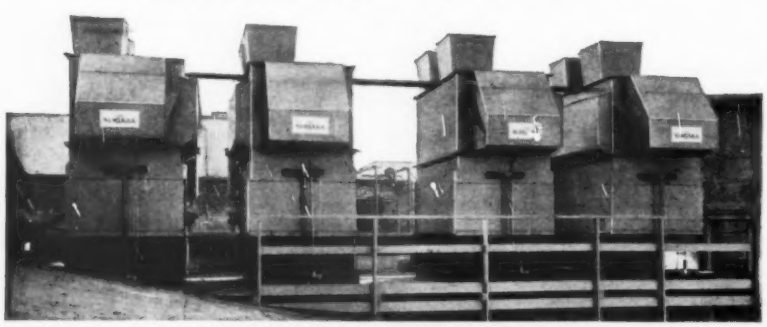
Both have the patented "Duo-Pass" and "Oilout" that remove superheat and keep the system free of oil. Results: you save one-third or more of power cost and upkeep expense. Niagara Patented Balanced Wet Bulb Control gives lowest head pressure operation automatically. *Write for Bulletin 111.*

NIAGARA BLOWER COMPANY

Over 35 Years' Service in Industrial Air Engineering

Dept. PE, 405 Lexington Ave. New York 17, N. Y.

Field Engineers in Principal Cities of U. S. and Canada



For more facts circle 553 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

keep workpieces supplied to the machine, and an offbearer to remove and stack the finished lumber on a shop truck. On moderate size stock, consequently, the work load on both men was relatively light.

To simplify the operation so that it could be performed by one man, a means of returning the finished stock to the loading area was necessary. At the end of the molder, a receiving table was built, with a steep slope at right angles to the machine delivery. Thus, as the finished piece leaves the delivery rolls, it falls on the sloping table and slides onto a conveyor, which runs parallel to and in the opposite direction to the work moving through the machine.

The conveyor, constructed on a movable frame, receives the workpieces and returns them to a spot near the operator feeding the raw stock into the machine. With the feed and discharge at one spot, the operator can unload and load workpieces at a smooth pace.

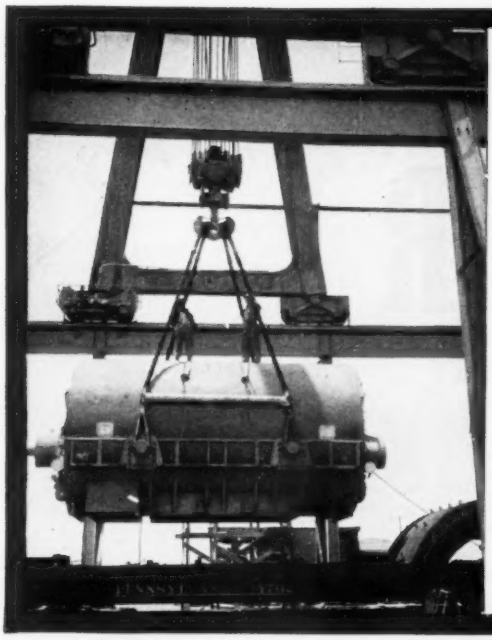
The conveyor itself was constructed in the shop, with a length of 6-in. belting serving as the carrier. A ¼-hp motor drives the belt pulleys, and the belt deposits the finished lumber on a level table where the operator can easily load them onto a shop truck. Conveyor belt speed is slightly higher than that of the delivery rolls on the molder, and the stock has no tendency to pile up on the machine.

With the conveyor constructed as a separate mobile unit, it can be used on any of several machines in the shop, and the U-shaped production line can be set up anywhere.

Charging Repaired Battery Cells

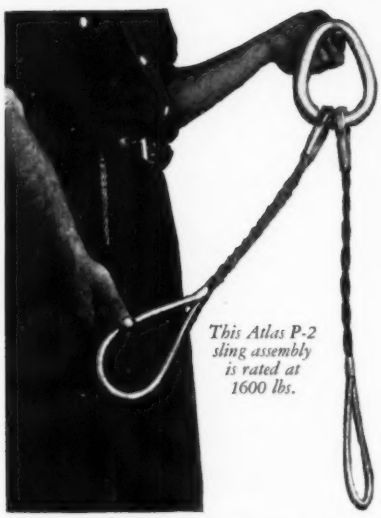
TO HELP BATTERY USERS solve the problem of repairing and recharging damaged batteries or cells, field service engineers of Gould-National Batteries, Inc., offer suggestions to recharge a repaired cell properly before putting it back in service.

Preferably, separate charging equipment should be used to give the repaired cell the extra charge necessary to restore it to operating condition. If the cell has been allowed to dry out because of loss of electrolyte, it needs a prolonged charge at the finish rate. In other words, a cell rated at 400 ampere hours which has dried out considerably might require 1,200 ampere hours of charge. Therefore, damaged cells should be repaired as quickly as the damage is discovered to eliminate excessive charging which keeps the battery out of serv-



Another job well done with Macwhyte Slings!

408,600-LB. GENERATOR SAFELY HANDLED WITH MACWHYTE ATLAS BRAIDED SLINGS



This Atlas P-2 sling assembly is rated at 1600 lbs.

Macwhyte slings are available for any load regardless of size. Our experience on thousands of applications is yours for the asking. Just write to Macwhyte Company, Sling Dept., Kenosha, Wis.

Macwhyte 8-Part Atlas Type 1 Round-braided Wire Rope Sling.

Safe installation of a $2,000,000 generator at the Valley Steam Plant of Los Angeles' Department of Water and Power required expert handling and finest rigging.

That's why Macwhyte Atlas Round-braided Wire Rope Slings were chosen to unload and install the largest and heaviest single freight shipment ever handled by the Southern Pacific Railroad. Lift was made with a 180-ton Moffett Crane using Macwhyte's Monarch Whyte Strand Wire Rope.

Macwhyte's *balanced* braiding gives Atlas Slings greater flexibility, longer life, resists spinning and kinking. Macwhyte slings and wire rope offer better service on any lifting job, large or small. Recommendations will be promptly made on request.

MACWHYTE SLINGS

Complete line of slings to fit your needs!

Three types of body are available: Atlas Round-Braided, Drew Flat-Braided, Monarch Single-Part. All are made to order in any size for any job. Suggestions for slings to meet your needs are promptly available.

READY now—new Circular Number 5308 showing strengths and safe-loads at various angles plus many sling designs. Ask for 5308.

See the hundreds of slings in Macwhyte Sling Catalog S-8

MACWHYTE COMPANY

2991 Fourteenth Ave., Kenosha, Wisconsin

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cable, Safe-Lock Assemblies, Monel Metal and Stainless Steel Wire Rope.

Mill depots: New York • Pittsburgh • Chicago St. Paul • Fort Worth • Portland • Seattle • San Francisco • Los Angeles • Distributors throughout U.S.A.

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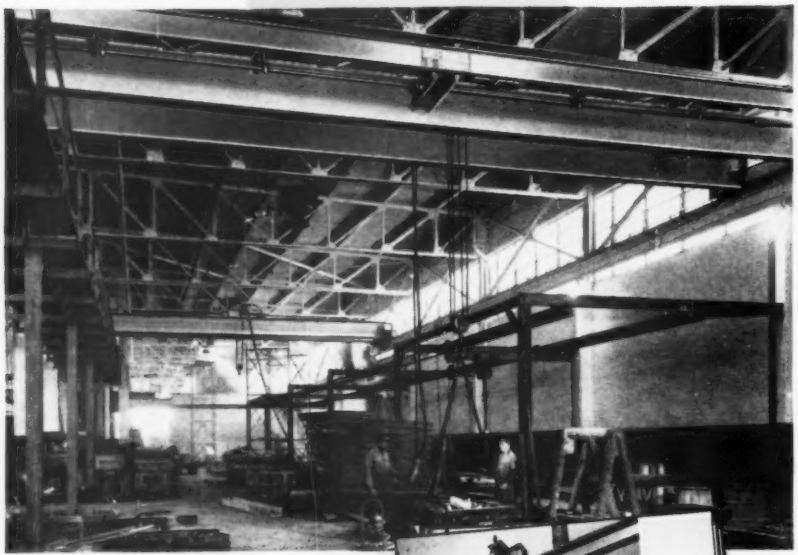
When considering Industrial Cranes in Capacities up to 15 Tons . . . Be Sure You Have the Facts About . . .

CRANEMASTER

TOP QUALITY . . . LOW COST!



No other overhead cranes of comparable quality are more conservatively priced or more dependable in operation. This explains why the **Cranemaster** is used in so many plants to STREAMLINE PRODUCTION and PARE DOWN COSTS . . . also why so many firms specify Abell-Howe Cranes again and again. Some are using 5, 10, even 20 and more of these service-proven units—because they have found them economical to buy . . . to operate . . . to maintain.

We invite you to make a check and comparison of our specifications and quotation to find just how much your crane dollar actually can buy at . . .

Ask for a copy of our NEW Cranemaster Catalog No. C114

ABELL-HOWE COMPANY

53 West Jackson Blvd.

CHICAGO 4, ILLINOIS

For more facts circle 555 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 54)

ice for long, unproductive periods.

The amount of charge can be determined by taking voltage and gravity readings at the end of the normal charge and every hour after that for four hourly readings. If the readings remain constant for four hours, the cell can be returned to normal duty. If the readings vary, additional charging at the finish rate should be given until the readings remain constant.

A badly damaged or shorted cell that does not give constant reading of voltage and gravity over a four hour period after repeated efforts should be discarded.

In all cases, the specific gravity of the repaired cell must be adjusted to the proper value after the cell has been recharged.

Where it is not possible to arrange for special charging, the repaired cell can be suitably charged by cutting the cell out of the circuit during operation of the equipment and putting it back in during charging. As an example, a repaired cell would be placed in the battery but not connected into the circuit while the truck is in service. At the time the entire battery is recharged the cell is connected into the circuit. Repeat for at least two charging cycles to allow the repaired cell to gain the additional charge required after repair.

To bypass the repaired cell, two 18-in. jumpers made of rubber covered cable can be used with automotive type clamp terminals soldered on each end. The posts of the repaired cell and the adjoining cells must be built up to fit the terminals.

Dual-Drive Fire Pump

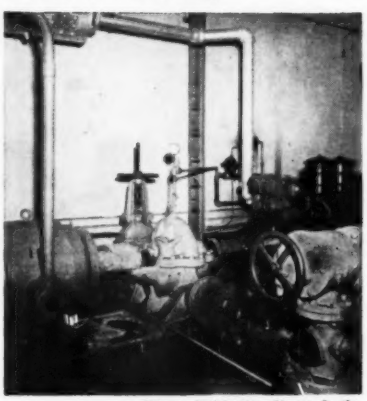
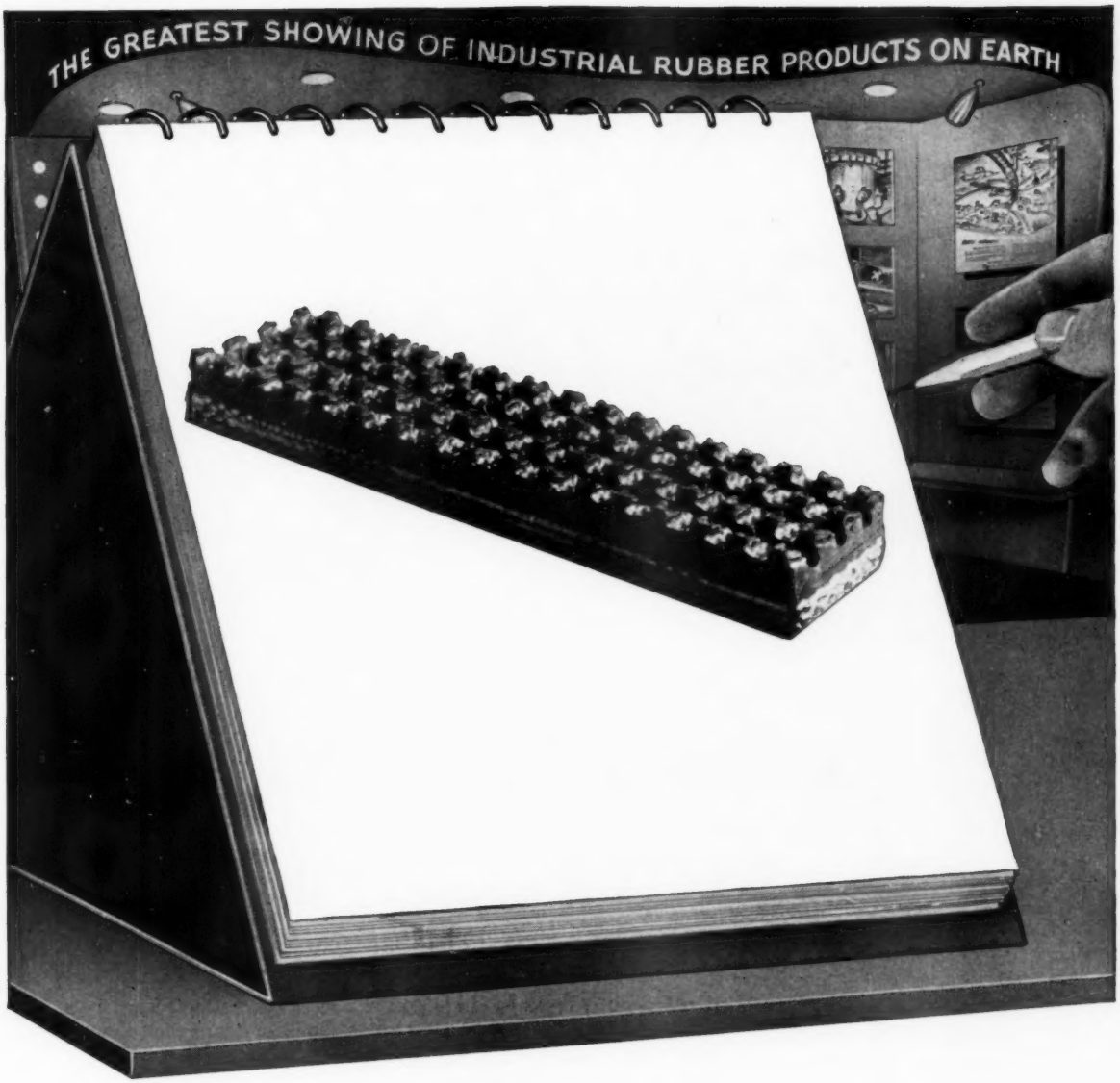


Photo: Fairbanks, Morse & Co.

Eight-inch fire pump sends 2000 gpm water into fire fighting systems at Pan American World Airways' overhaul base in Miami. Complete protection is provided by dual 150-hp drive—electric motor or standby diesel engine power



Convey Packages Uphill *(or down)* on "Super Grip" Fingers

On our screen, we are showing you a close-up view of Super Grip Package Conveyor Belting. Notice the specially moulded fingers that project from the surface of the belt. These fingers literally anchor packages and other bundled material to the belt while being conveyed uphill or down. Yes, even on grades as steep as 30°. Super Grip Package Conveyor Belting, just one item in a complete line of belting, hose and packing, is available at your local Republic Distributor—call him today. If his name is not in the yellow pages of your phone book, write directly to us.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1 OHIO

INDUSTRIAL RUBBER PRODUCTS

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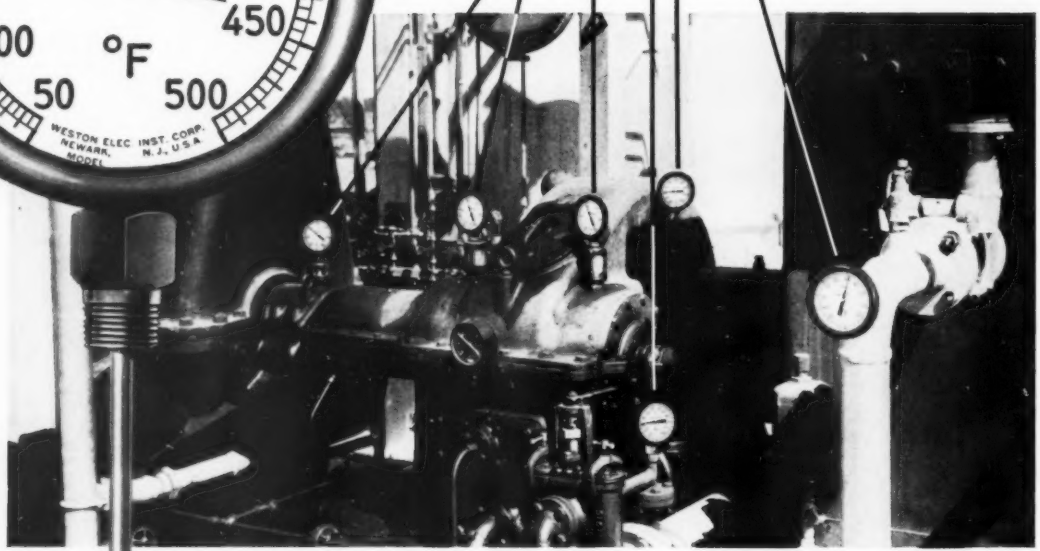
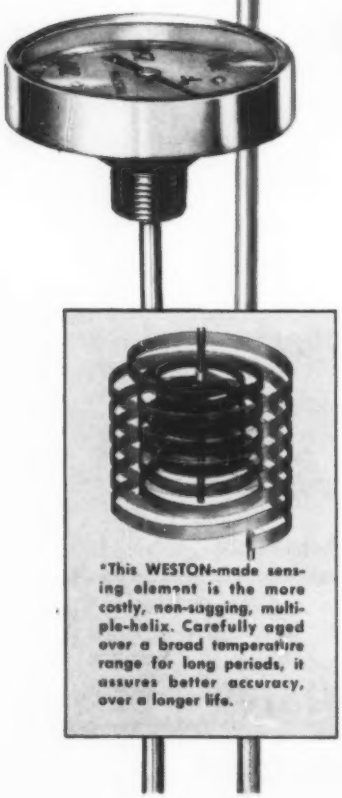
AT EVERY CHECKPOINT





*This WESTON-made sensing element is the more costly, non-sagging, multiple-helix. Carefully aged over a broad temperature range for long periods, it assures better accuracy, over a longer life.

WESTON *all-metal* THERMOMETERS

(with Multiple Helix)*

Here's another typical example of how large processing plants have solved temperature checking problems, and cut thermometer costs besides. With a WESTON dial-type thermometer at every checkpoint, temperatures are read at a glance . . . in far less time, and with far greater accuracy. Their sturdy all-metal construction resists breakage, gives them far longer life on operating equipment. And the exclusive WESTON multiple helix employed assures dependable accuracy during all this long life.

Available in a broad selection of types, sizes, ranges and stem lengths, WESTON thermometers are today standard on all types of mobile and stationary equipment and machines, large and small; as well as on piping, conduit, ducts, etc. Ask your distributor, or local WESTON representative for complete information, or write for descriptive bulletin . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

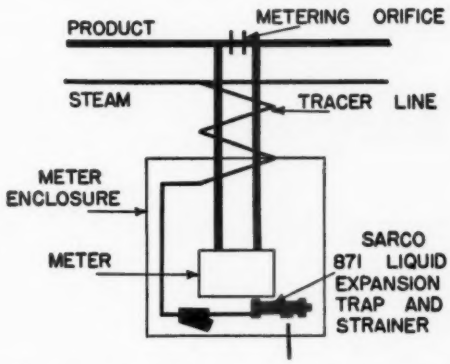
WESTON 5537 *Thermometers*

Stocked by leading Distributors

For more facts circle 557 on Reply Card

Is this your TRAPPING PROBLEM-

To save steam and fuel by using the sensible heat of waste condensate ?



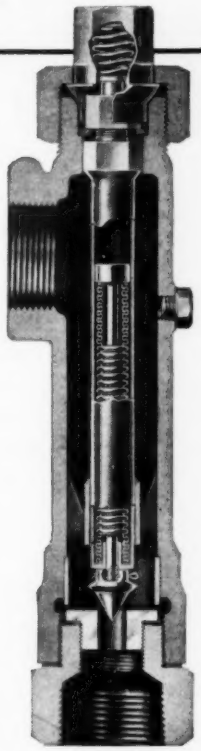
Instrument cabinet tracer line fitted with compact Sarco Liquid Expansion trap . . . discharges below 212°F, saving steam and fuel.

. . . how to be sure you select the right trap!

IT ALL DEPENDS on what you want in a trap . . . what you expect it to do. For example, if your equipment can effectively use the sensible heat of waste condensate—as in heating an outside instrument cabinet installation—then here's the right trap for you. It discharges condensate below 212°F.

The Sarco Liquid Expansion Trap, one of the five types Sarco makes to meet industry's trapping needs, has the following characteristics:

1. Discharges condensate at adjustable temperatures *below 212°F* thus saving steam and fuel.
2. Not affected by freezing weather, water-hammer, vibration, pressure pulsations, or superheat.
3. Compact: for example, ¾" size is only 8⅜" long.

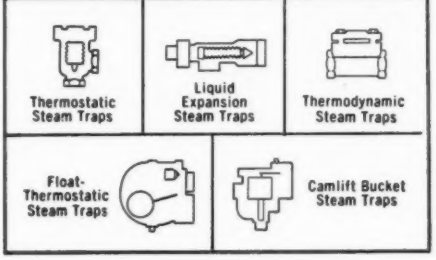


SARCO LIQUID EXPANSION THERMOSTATIC STEAM TRAP

Sizes ½" to 2", pressures to 450 psi. Write today for Bulletin 260.

Only Sarco Makes All 5 Types

That's why Sarco can give impartial advice on proper trap selection!



HELPFUL BULLETIN:

For pertinent information on trap characteristics and selection, write for Bulletin 145, "Selecting The Right TYPE Steam Trap."

ENGINEERING SERVICE:

You can count on getting unbiased advice from Sarco engineers. Next time you need help on your trapping problems, call your local Sarco representative or write Sarco Company, Inc., Empire State Building, N. Y. 1, N. Y. Representatives in principal cities.

SARCO *improves product quality and output*

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

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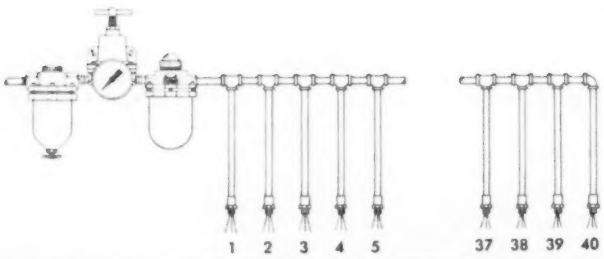
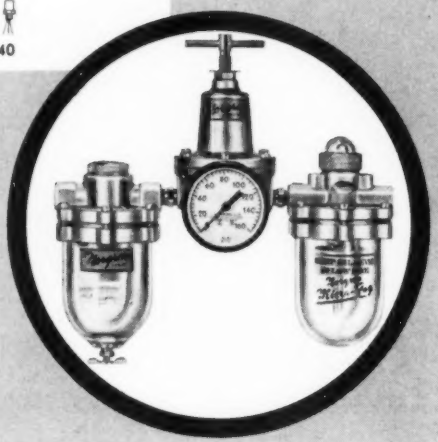
tests prove

Norgren Micro-Fog Lubricator

• gives absolutely uniform lubrication thru 40 outlets





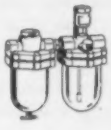
The extremely fine air-borne Micro-Fog provides absolutely uniform distribution of lubricant through as many as 40 outlets... for bearings, spindles, gear boxes, etc.

Two exclusive features of the Norgren Micro-Fog Lubricator—constant oil level and metering of oil feed by air—assure an exactly uniform and accurately regulated rate of feed.

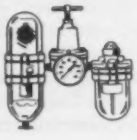
Norgren Micro-Fog lubrication systems have enabled hundreds of manufacturers to obtain greater flexibility in product design and plant layout; improve equipment performance; and reduce maintenance costs.

PIONEER AND LEADER IN OIL-FOG LUBRICATION FOR 26 YEARS

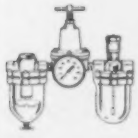
VALVES • FILTERS • REGULATORS • LUBRICATORS • HOSE ASSEMBLIES



Vitalizer Unit for tools, cylinders, etc.



Micro-Fog Lubro-Control Unit for bearings, spindles, gear boxes.



Micro-Fog Lubro-Control Unit for tools and cylinders requiring regulated air pressure.

Micro-Fog Lubricator, tank type, 1¾ gal. cap.

WRITE FOR NEW CATALOG No. 600

C. A. Norgren® CO.

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For more facts circle 559 on Reply Card

COURT DECISIONS — a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Basic Reasons Behind Zoning Ordinance

A zoning ordinance of Euclid, Ohio was attacked by the owner of land within the restricted area on the ground that, since the ordinance reduced the normal value of property and for that reason deprived its owner of property without due process of law, it was unconstitutional and void.

The Supreme Court of the United States, sustaining the right of a municipality to adopt and enforce zoning ordinances, said,

"Building zone laws are of modern origin. They began in this country about twenty five years ago (1901). Until recent years urban life was comparatively simple; but with the great increase and concentration of population problems have developed and constantly are developing, which require and will require additional restrictions in respect to the use and occupation of private lands in urban communities.

"Such regulations are sustained under the complex conditions of our day for reasons analogous to those which justify traffic regulations which, before the advent of automobiles and rapid transit street railways, would have been condemned as fatally arbitrary and unreasonable.

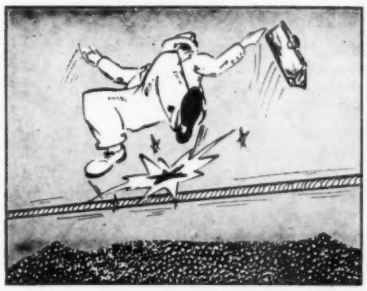
"In the changing world it is impossible that it should be otherwise. But although a degree of elasticity is thus imparted, not to the meaning but to the application of constitutional principles, statutes and ordinances, which, after giving due weight to the new conditions, are found clearly not to conform to the situation, of course must fall. A regulatory zoning ordinance which would be clearly valid as applied to great cities, might be clearly invalid as applied to rural communities.

"In solving doubts, the maxim (So use your own property that you do not injure the property of others) which lies at the foundation of so much of the common law of nuisances, ordinarily will furnish a fairly helpful clue."

Injuries to Licensee

A judgment was rendered in favor of an employee of an independent contractor against a New Jersey smelting and refining company for $2,000 for injuries incurred through the negligence of an employee of this plant.

While crossing the premises the man was plainly visible to a smelting plant employee operating the cable in a derrick house. The cable operator without warning tightened the



cable as the man stepped across it and the cable snapped inflicting the injuries for which this action was brought.

In affirming this judgment against the smelting company the New Jersey court stated the principle of law governing the liability to the employees of independent contractors when on the premises of the one employing the contractor.

"While there is no duty owing to a mere licensee except to abstain from acts wilfully injurious, nevertheless an act may be wilfully injurious whether or not there is ill will toward or a positive intent to injure the person harmed.

"The emphasis is on the reckless indifference to the consequences of the deliberate act or omission in the face of known circumstances and the high degree of probability of producing the harm.

"To establish a wilful or wanton injury it is necessary to show that one with knowledge of existing conditions and conscious from such knowledge that injury will likely or probably result from his conduct, and with reckless indifference to the consequences, consciously and intentionally does some wrongful act or omits to discharge some duty which produces the injurious result."

Cement Plant Nuisance

A cement plant in Spokane Valley in the state of Washington, with an average production of 600 to 800 barrels a day, had been constructed for ten years when a 90 acre estate was built about 3,000 ft from the plant, on the other side of the Spokane River.

Dust from plant operations covered the estate buildings, seeping into the interiors, turning the color of tile roofing to a dull grey and killing the shrubbery, until the owner maintained that the only remaining use for the property was a mere shelter.

In its decision in an action brought by the owner of this estate for damages the Washington appellate court said, in holding the estate owner entitled to a recovery:

"The thought is inherent that not even a fee simple owner has a totality of rights in and with respect to his real property. Insofar as the law of nuisance is concerned rights as to the usage of land are relative.

"The general legal principle to be inferred from court action in nuisance cases is that one land owner will not be permitted to use his land so unreasonably as to interfere with another landowner's use and enjoyment of his land. The crux of the matter seems to be reasonableness. Admittedly the term is a flexible one. It has many shades and varieties of meaning.

"In the nuisance case the fundamental inquiry always seems to be whether the use of certain land can be considered as reasonable in relation to all the facts and surrounding circumstances. Application of a doctrine of nuisance requires the balancing of rights, interests and conveniences."

Parking Lot Liability

An automobile was left in an open lot adjoining an automobile paint shop with the understanding that the owner of the car would pay $15 a month for storage and the paint shop proprietor estimate the cost for rehabilitating the automobile. Later the automobile owner was told that his car "was not worth repairing and it might as well be pulled out."

The owner of the car sued for damages for injuries to the car while on this lot. In its decision that no liability rested on the paint shop proprietor for such injuries the Indiana court said,

"In our opinion the evidence in this case discloses nothing more than a situation wherein the owner of this lot furnished the car owner open air space on an unguarded lot in which he parked his car for two months and for which the lot owner charged him $30.

"The liability of a person who for monetary consideration permits another to park his car on his premises, for damages thereto, depends on whether a bailment is made, or whether merely space to park is leased. In deciding this question the determining factor is usually whether or not possession and control is given the owner of the premises.

"It is essential to the creation of the relation of bailor and bailee that there be a delivery of the property to the bailee. In order to constitute a sufficient delivery in any given case it is a general rule that there must be such a full transfer, either

COURT DECISIONS

actual or constructive, of the property to the bailee as to exclude the possession of the owner and all other persons and give to the bailee for the time being the sole custody and control.

"When he merely grants storage space without assuming expressly or impliedly, any duty or responsibility with respect to the care and control of the property stored, he is a landlord and not a bailee."

Delivery in Reasonable Time

A distributor of petroleum products in Seattle, Washington, telephoned an order for heavy steel pipe fittings and with the acceptance of the order it was agreed that a portion of these fittings would be delivered immediately and the remainder within 30 to 45 days.

The same day the buyer forwarded the seller a printed purchase order stamped "confirmed." No reference whatever was made in this order to the delivery date of the goods. A few weeks later, with some of the goods delivered, some en route and others in the process of manufacture the purchaser cancelled the order, claiming deliveries had not been made on time.

The Supreme Court of that state, sustaining a judgment for $6,909.42 in favor of the seller as damages for this cancellation, said of deliveries under sales contracts in which no delivery date is set,

"The petroleum company's order was a written contract in which no time for delivery of the goods was fixed, hence the seller was required to deliver the goods within a reasonable time. Where by a contract to sell or a sale the seller is bound to send the goods to the buyer but no time for sending them is fixed, the seller is bound to send them within a reasonable time.

"The rule which needs no citation of sustaining authority is that what is a reasonable time is to be determined by all the circumstances. One of the circumstances in this instance was World War II in which all our resources were employed. Another circumstance of which the court may take judicial notice was the manufacturing and labor situation in 1944."

Manufacturer's Warranty

Two motor trucks were sold by a manufacturer under a sales contract provision warranting the trucks, "Free from defect in material or workmanship under normal use and service, the manufacturer's obligation under this warranty being limited to making good at its plant any part or parts thereof which shall be returned to it with transportation charges prepaid and which its examination shall disclose to its satisfaction to have been thus defective, provided that such part or parts shall be so returned to it not less than 90 days after delivery of such vehicle to the original purchaser and that at the time of such return the said vehicle shall not have been operated in excess of 5,000 miles."

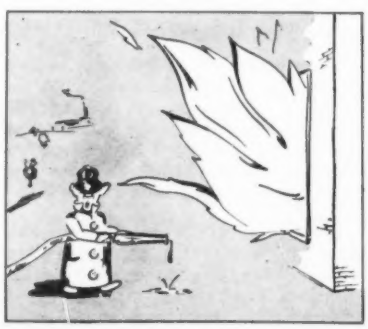
Due to defective insulation the batteries of both trucks became short-circuited and the trucks destroyed by fire through the ignition of the gasoline. Suit was brought to recover on the warranty that the trucks were free of defects in material and workmanship. Holding that no recovery could be had for a breach of this warranty the Ohio court said,

"It is obvious that the seller and purchaser of any article may make a definite contract limiting the liability of each under the contract and it will be noted that under the warranty in question the seller went no further than to agree to make good at its plant all defective parts of the contract which might be returned to the plant within three months from the time of the sale provided that at the time the truck had not been run exceeding 5,000 miles.

"There was no charge or proof that at any time the seller was given any opportunity to remedy any defects of material or workmanship in the contract as required by the contract. The parties to this litigation made a contract which they had a right to do and no court is authorized to alter or change the terms of the contract."

Water Company Liable for Fire Damage

A manufacturing plant in New Jersey contracted for water with a pressure sufficient for fire protection. A connection in the principal main of the water company gave way one night at a point where the main crossed the bed of a stream, with a consequent loss of pressure. The water company was notified but



the leak was not located until after thirty-six hours in which time this consumer's factory had caught fire and been destroyed.

The water company sued to collect the payments due under its agreement with the plant and the plant owner set up as a counterclaim the damages from the fire occurring as a result of the drop in pressure.

Awarding the plant owner a judgment against the water company the court said,

"The water company expressly contracted to supply water for fire purposes. The company failed to do so and the premises of the manufacturing plant took fire occasioning a considerable loss. Assuming this result was due to the breaking of pipes without any fault on the part of the water company we have a loss to be borne by one party or the other. In such a condition of affairs when one of two innocent persons must sustain a loss the law casts it upon him who has agreed to sustain it, or rather, the law leaves it where the agreement of the parties has put it. Between accidents by the fault of the contractor and those where he is without fault, they all rest upon the same principle—such is the agreement, clear and unqualified."

Set-Back Requirement

An ordinance adopted by Islip, New York provided for a set-back of ten feet from the street on land zoned for business purposes. On an appeal from a judgment declaring the ordinance void as arbitrary and unreasonable the Court of Appeals of that state said in reversing the judgment,

"One of the most simple and necessary preventives of overbuilding business blocks is to require that when blocks occupied by dwellings are converted into business that the original set back of the residences should be retained. When we come to consider the need of adequate space for purposes of access and parking vehicles, we will find that what we are wanting are wider streets and deeper lots rather than increased frontage. But the really important question is the preservation of adequate open space about the business buildings in the places where it is wanted to enable business to function efficiently.

"In many districts there is ample space in the aggregate but it is not properly distributed so as to give satisfactory means of access, space for loading and unloading, room for parking without interference of through traffic and sufficient ventilation. With adequate zoning regulations sufficient space could be provided about each group of business buildings to meet all their needs without increasing their frontage.

"It thus appears that a wise policy may require the owners of any buildings in business districts under proper conditions to set their buildings back from the street to enable their business to function without congesting the streets."

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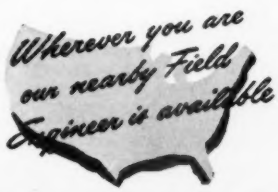

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Problem: Material hard on pumps—being slightly corrosive and abrasive.
Solution: Moyno pump on duty for the past two years; has required practically no maintenance. Customer very well pleased.

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Problem: 40 to 60% loss of clay slurry.
Solution: Moyno pump in use for the past 2 years has reduced above production losses to average of less than 5%.

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Problem: Continuous failures of centrifugal pumps.
Solution: Moyno pump still giving perfect service after 1½ years of 24-hour-per-day operation.

4 **Material:** Special Navy Paint Mixture.
Problem: Low volume of gear-type pump; necessity for pre-heating paint before pumping into tank cars.
Solution: Moyno cut tank car filling time from 10 hours to 2⅓ hours. No need to pre-heat paint. No maintenance costs since Moyno was installed 2 years ago!

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Problem: Rotary pumps wore quickly, lost capacity, and had too little suction.
Solution: Moyno pumps cut maintenance and repairs to minimum—had ample suction for drawing caustic through the cloth.

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Problem: Frequent pump breakdowns caused by back pressure of 5 spray nozzles.
Solution: Moyno pumps cut pumping time from 20 minutes to 3 minutes and also reduced down time. Both helped to increase production 200%!

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Precast slabs permit Rex Mfg. Co. to make layout changes in its plant with a minimum of work interruption . . . If an opening is needed in the floor, workmen need only to knock out the grout and remove the necessary slabs

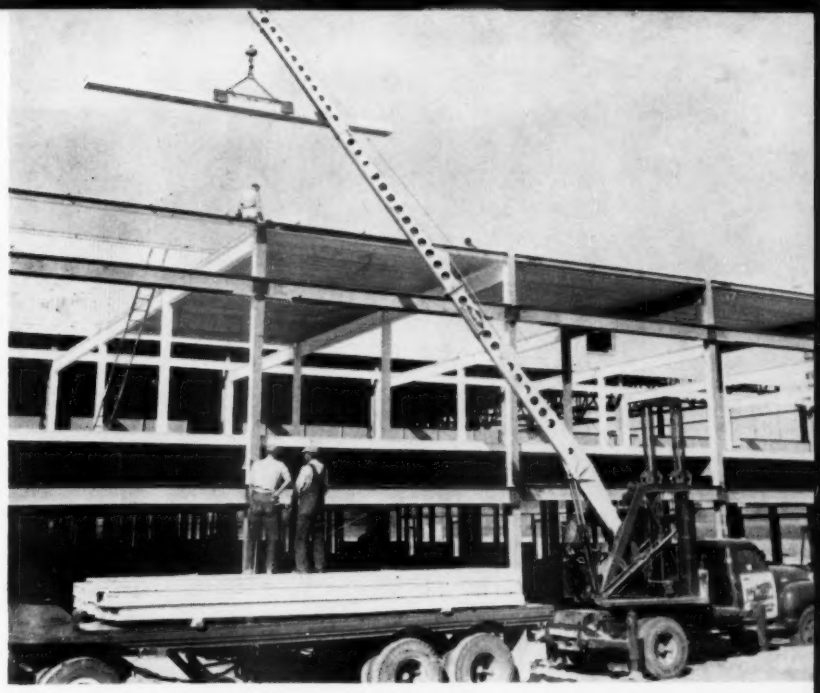


Fig. 1. Precast slab roof is being erected in office building adjoining main plant, at Connersville, Indiana. Slabs were also installed on second floor

Floors at Rex Are Flexible To Meet Plant Layout Changes

IN PLANNING FOR future manufacturing methods which may require changes in the Rex Manufacturing Co. plant layout, architects Giffels and Vallet wanted a floor in the mezzanine area to carry a heavy live load, yet be flexible enough to permit making new conveyor openings easily. The answer, they found, was Flexicore.

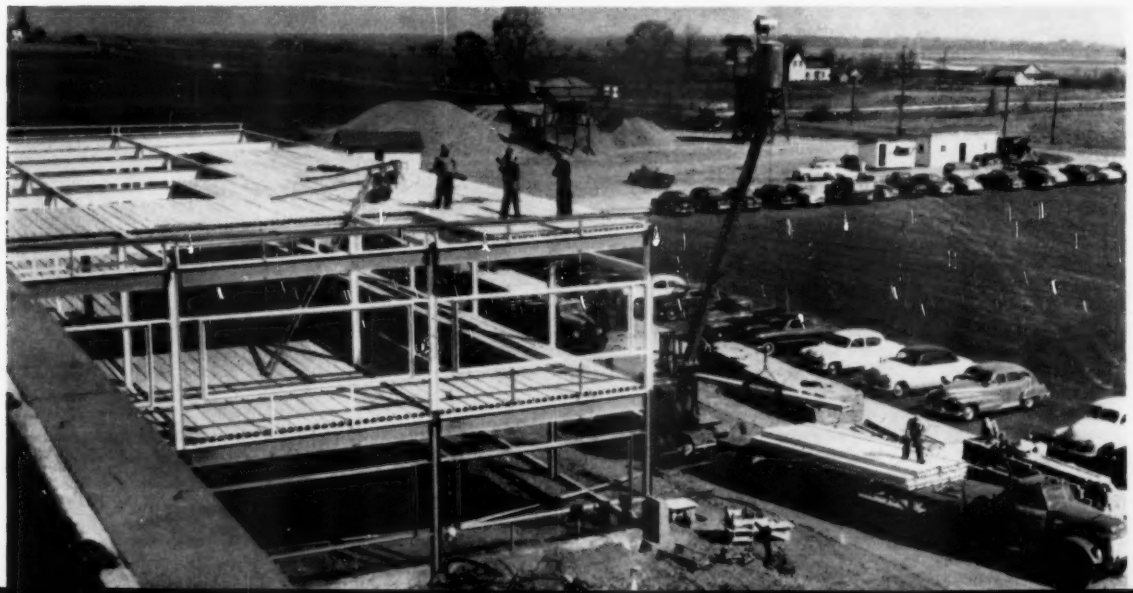
Primary reason for Rex selecting this material was because of the ease with which it will adapt to plant layout changes and new requirements for openings. Future conveyor openings, for example, will be approximately 4 ft by 20 ft. Therefore, 8 by 16 in. slabs were precast in the lengths required, mainly 20 ft spans. The mezzanine is designed for 140 psf live load, and intended for light assembly, stockrooms, storage and light stock trucking.

When a new conveyor opening is decided upon, workmen will need only to knock out the grout and remov three slabs. No major alteration in the floor will be needed, and there will be a minimum of work interruption in surrounding areas.

Formation of the hollow cores of these precast slabs is done by the use of an inflated rubber tube specifically designed and made for the forming of such ducts. The concrete is poured around the tubes inflated to a specified diameter.

Conversely, on deflation, there is a simultaneous two-way movement

Fig. 2. Another view of the office building shows the 8 in. by 16 in. slabs used for the second floor of the office building, to meet a 100 lb live load requirement. For the 40 psf roof, the lighter 6 in. by 12 in. precast slabs were used



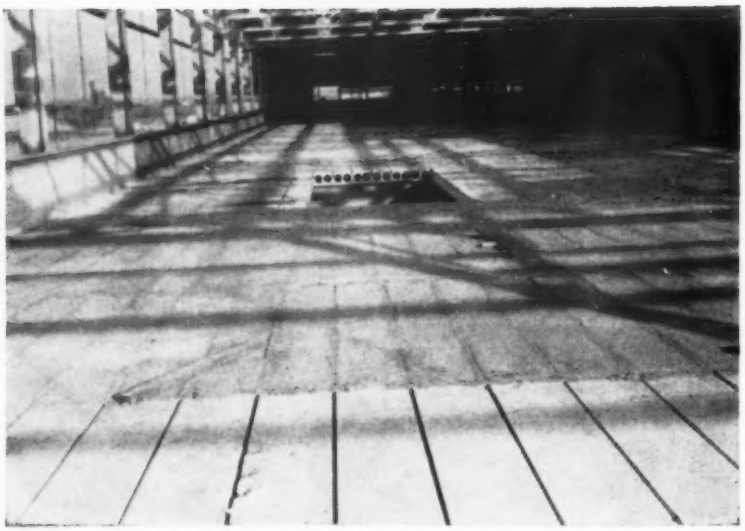


Fig. 3. Six slabs have been left out of the flooring to permit space for an elevator opening. Similar alterations can be made later to meet layout changes

which causes the tube to detach itself from the surrounding concrete. The tubes are then removed and reused.

The tubes are heavily constructed for forming the straight, hollow cores and are held in position so they are separated and also so they do not float during the pouring and vibration period.

Major factors contributing to the selection of this material were its speed of erection, the reduction it permitted in structural steel and reduction of future maintenance cost. Fire resistance of the slabs was also of importance.

The mezzanine runs the length of one 760 ft side of the plant and extends 240 ft along the short dimension of the plant, with several cutback areas between each end. Steel is placed on 20 ft centers. The mezzanine area is fenced with a steel parapet. In addition to several stairwells and conveyor openings, the mezzanine has two 10 by 11 ft openings for elevators. These were easily provided by interrupting slab placement for the space required.

Stairwell openings are framed in steel; elevator openings have steel framing at the edges with poured, reinforced concrete curbs. Slabs 8 by 16 in. form most of the mezzanine floor but the lighter 6 by 12 in. slabs were used for three toilet areas.

In the mezzanine area, slabs were covered only with ½ in. Tremco asphaltic type mastic. It was selected to provide resiliency necessary for standing workers (many of whom will be women) and at the same time take light trucking quietly. The same mastic was used over slabs in the office area as an underlay for asphalt tile.

The smooth underside of the mezzanine slabs will be left exposed. Caulking and painting will provide an attractive finish. Future ceiling maintenance is reduced by the elimination of plaster cracks and sagging and warping problems.

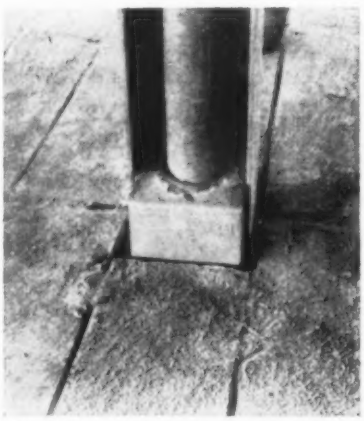


Fig. 4. Some slabs were cast in shorter lengths to fit around supporting columns

For the second floor of the office building, the 8 by 16 in. slabs were used, meeting a 100 lb live load requirement. For the 40 psf roof, the lighter 6 by 12 in. slabs were used. Roof treatment is built-up roofing.

The hollow cores of the second floor slabs are being used as raceways for electrical wiring. At the joints where slab ends butt together over bearing beams, the cores were kept free of grout by insertion of 1 by 1 in. wood strips in the butt joint, prior to grouting. The wood strips were supported by short pieces of steel rod placed in each logitudinal grout joint so as to span between the slab ends. This procedure permitted the cores under the entire second floor area and over the entire first floor ceiling area to be utilized for wiring. The hollow cores of these slabs could also be used to provide "built-in" warm air ducts for panel heating.

Much of the piping and other mechanical fixtures in the plant were hung from hangers, fastened with toggle bolts to the precast slabs.

Fast erection of precast slabs gave immediate shelter to workmen on the ground level. Cranes moved in between columns to lift the slabs. A poured ground floor slab was put in after the Flexicore erection was complete.

Cranes hoisted slabs directly from the delivery trucks to place in the plant area, where trucks were able to move freely among the columns. On the office building, carts were used to place slabs in areas where the crane could not reach. As bays were placed, workmen followed to level and grout the slabs.

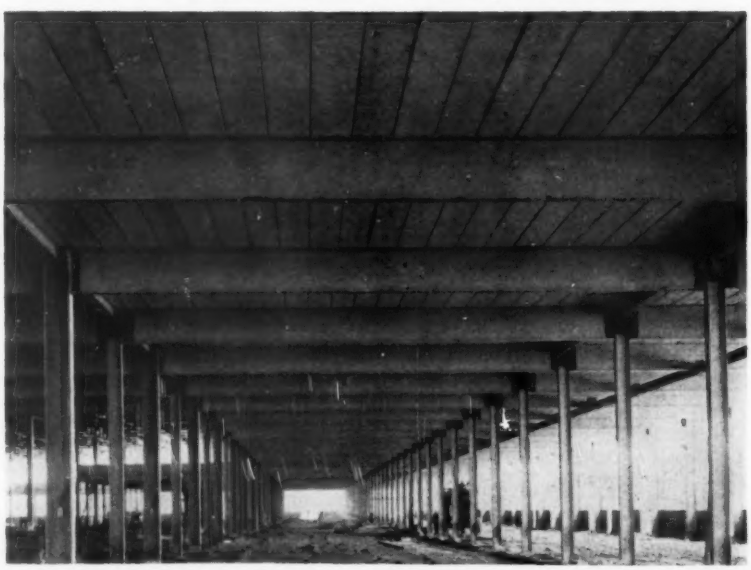


Fig. 5. Underside of mezzanine area shows precast slabs in place on beams set on 20 ft centers. Caulking and painting is all that is necessary to complete ceiling

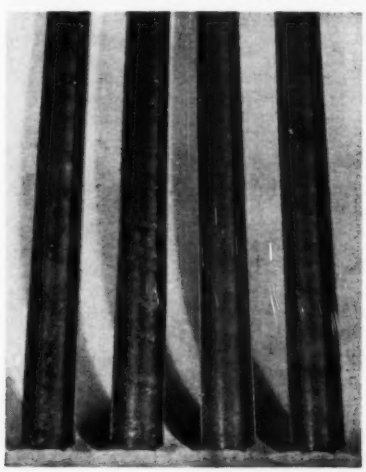
THE TUBE CLEANER— Jack of All Trades

By L. A. KUNZLER,
Asst. General Manager,
Lagonda Div., Elliott Co.

Fig. 1. Workmen inserting a big air-driven tube cleaner into a length of 19¼ in. ID pipe, used on pipe ranging in diameter from 1 to 23½ in.

TUBE CLEANERS are not exactly new, having been used for forty years or more in a variety of forms. Originally designed to remove scale from the inside of tubes in water-tube boilers or from the outside of fire-tube boilers, they quickly took over still tube cleaning in thermal cracking units of refineries. The inherent mechanical features of the designs have suggested many other uses, for the simple, rugged construction of the motors, cutter heads, brushes, and drills are a natural for those tough, dirty jobs so often being performed by hand.

Fig. 2. Split samples of plastic impregnated tubes before, during and after cleaning operation with tube cleaners



Air motors are available in sizes from 15/32 in. on up. Output and speed depend mainly upon air pressure for they have no governor. All sorts of cutter heads from scrapers to vibrators make possible a trial-and-error decision, and brushes of nylon, brass, and steel can be used for all types of polishing work.

There are hundreds of unusual jobs now being performed by tube cleaners in one form or another, and this article is intended to illustrate only some of the more common usages aside from their original purpose. The difficulty of securing pictures, and some of their more restricted uses, prevent illustrations of some of the most unusual applications.

Used pipe should be cleaned internally before it can be put back into service. When stacked in a yard, as in Fig. 1, it is easy to get at —a portable compressor, length of hose, the proper size motor and type of cutter head take the dirt and noise away from an operating plant.

Shutdown time could easily be avoided with a little preventive cleaning before putting in service new lines. One large Eastern manufacturer, after continuous trouble with scale cutting out large steam valves, decided to investigate tube cleaners.

New fabricated piping going into the company's new steam power plant was supposed to be clean, but a tube cleaner was passed through a 12-ft. length of 8-inch pipe as a test. A cheesecloth screen was tied over one end of the pipe to retain any dirt. Whereas the pipe had looked clean, in one pass two handfuls of black mill scale, some pieces as large as a thumbnail, ended up in the cheesecloth.

Mill scale is very well bonded to the inside of a pipe, but it has the bad habit of breaking loose bit by bit with thermal shock. A complete set of tube cleaners for all sizes of curved and straight fabricated pipe was purchased and certainly must have paid off for it is now standard procedure in this company.

For another manufacturer, the process of vacuum impregnating spirally-wound paper tubing presented the difficulty of maintaining a rigid specification on the inside diameter of the tubes. After curing, small resin deposits prevented the

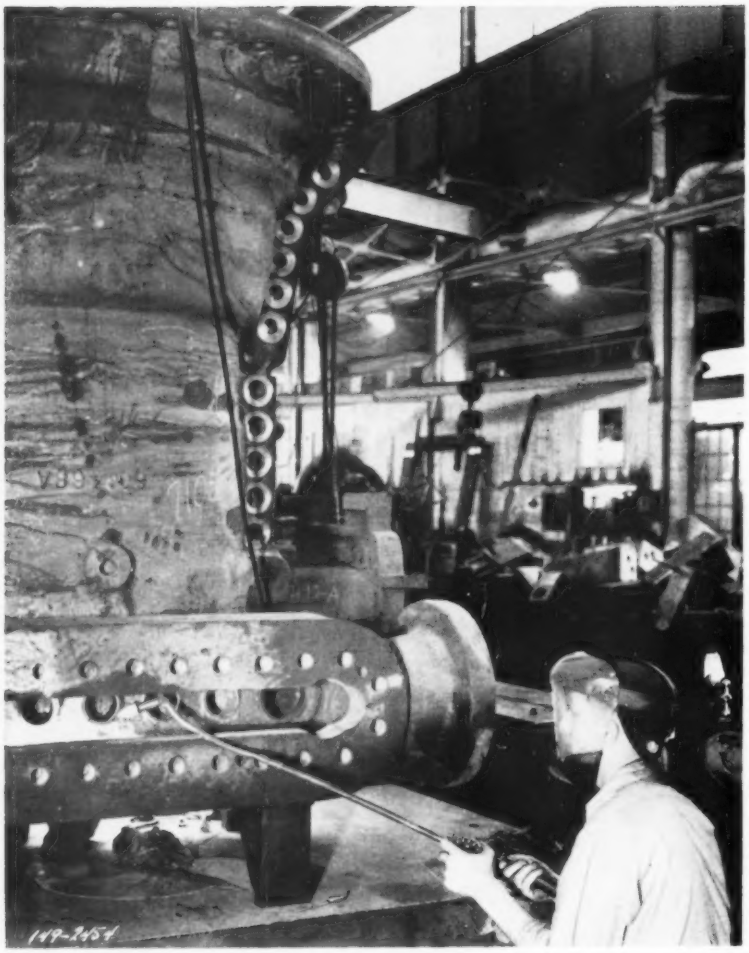


Fig. 3. Method of cleaning internal-cored steam chest passages in a steam turbine casing. Cleaner motor is fitted with a grinding stone and length of bent pipe

holding of a + 0.002 in. tolerance on the inside diameter. A small tube cleaner motor connected directly to an expanding brush cleans a 4-ft. section in approximately six seconds. At the time the picture, Fig. 2, was taken, 250,000 ft. of tubing had been cleaned with very little equipment expense.

A manufacturer of large steam turbines experienced difficulty in removing sand and burrs from hard-to-get-at places. The use of a bent file through small openings, in addition to a pickling process did not prove satisfactory; sand and burrs were still working into valves and bearings. A small tube cleaner motor, Fig. 3, threaded onto ¼ in. copper tubing used as an air supply, and standard conical-shaped grinding stones threaded on the motor shafting, permitted the operator to reach through small openings and clean almost any spot in the casting. The copper tubing was bent to any angle desired. Exhaust air from the motor blew away the cuttings. Barked knuckles, as well as many man hours, were saved.

One pipe manufacturer making centrifugally cast pipe was plagued with small beads inside the pipe. The company had a chance to secure a large order for pipe, but the pipe had to allow the passage of a certain size plug gauge. The problem of course, was to remove the small internal beads on which the plug gauge was continually hanging up. No pictures are available, but after testing several types of tube cleaners, a large external condenser cleaner motor, stiff shafting and carbide-tipped drills were found practical. The original work was done on 1-½ in. pipe, but several other sizes have been cleaned the same way, simply by using other size carbide-tipped drills.

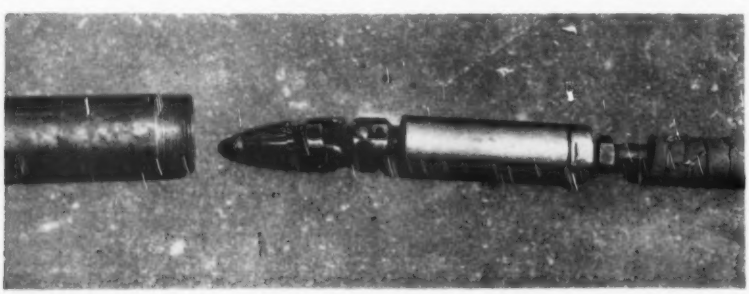
One of the problems in steel making is the periodic shut downs to clean open hearth checker flues. On numerous occasions a furnace is taken off although it could have run many more hours simply because the checker flues were clogged but as soon as they were opened up the furnace could go back on the line. Laborers with hand scrapers required approximately 170 man-hours for a none-too-satisfactory job. A powerful tube cleaner motor connected to a drill opened the completely clogged flues in short order. Saving of 110 man-hours was made.

How would you repair a leak in an underground gas line? The answer would seem obvious—dig down to the pipe, then patch or replace it.

An easier and less expensive method was found by one company; feed copper tubing through the existing pipe and make only one small excavation where the service line ties into the main. Once again tube cleaners took on an odd job, for a motor with a universal joint and drill head, Fig. 4, was used to ream out the old service line and blow out the cuttings. New soft copper tubing was pulled through the old line and connected at the main and basement with special compression fittings. The financial savings of 50 to 65 per cent are very impressive and the increase in production of 350 per cent is very important.

Such tube cleaner applications are merely a few of the more common jobs but there are hundreds more. A special cleaner with no operating hose was built to clean long stretches of underground conduit; with brushes and a handle it is a portable hand tool; the motor is fitted with a chuck and used as a hand drill; the motor drives a special grinder for refacing hand hole seats in a boiler; the cutter heads clean magnesium retorts, and with special apparatus the motor drives a drill to remove catalyst from vertical tubes. Don't overlook the possibilities of this versatile tool for it could save your company money.

Fig. 4. Type of tube cleaner, equipped with a universal joint and drill, which is being used to clean existing gas pipe prior to the insertion of copper tubing



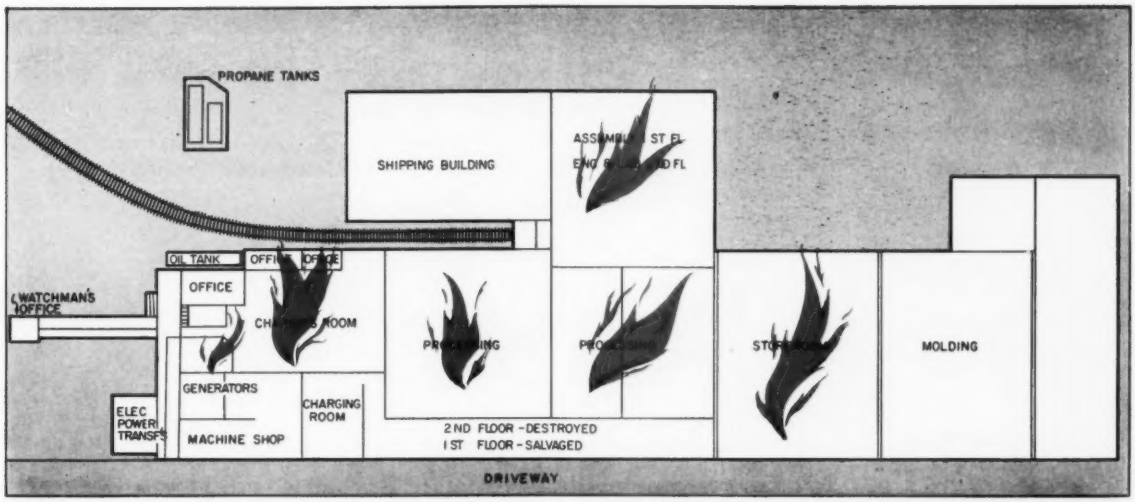


Fig. 1. Approximately 75 per cent of the productive area was destroyed by fire as can be seen from layout above

Three Days after Fire C & D Batteries was Back in Business

The fire that broke out in the C & D Batteries, Inc., plant at Conshohocken, Pa. was almost disastrous . . . However, because of the splendid spirit of the employees and management, plus generous help from friends, neighbors, customers and suppliers, the fire was not fatal to the business

By R. L. MARINELLO, Managing Editor

DESPITE A MILLION DOLLAR FIRE that destroyed the main plant buildings, offices, engineering and laboratory departments of C & D's plant at Conshohocken, Pa., on Sunday, November 29, limited production was resumed in three days. Approximately 75 per cent of the manufacturing area was destroyed. (This does not include the office, engineering and laboratory area which were 100 per cent destroyed.) The remainder of the production area that was salvageable is illustrated in Fig. 1.

Breaking out about 1 a.m. on Sunday, the fire raged uncontrolled through the block-long plant for more than four hours. Firemen from eight companies finally succeeded in putting the fire out about noon Sunday.

Eight Hours Later—Even before the fire was out, management held a meeting at 9 a.m. to survey the damage and to decide what steps would get production going again.

Fig. 2. View shows interior of assembly room where battery cells were placed in steel containers before final assembly

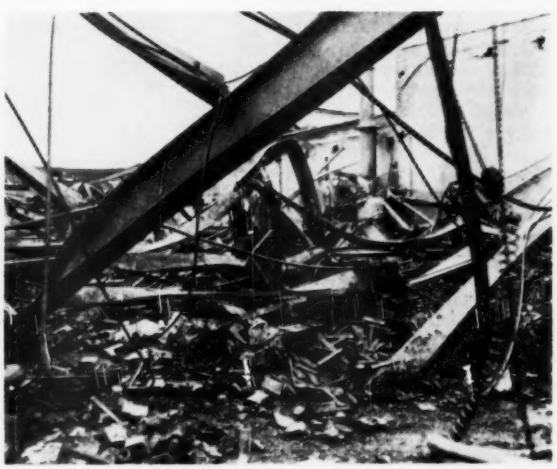


Fig. 3. Twisted girders rest on assembly floor after fire. Furnace in background supplied steam for processing

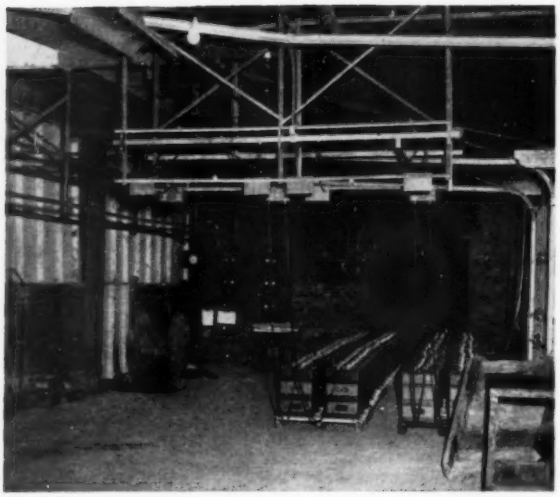


Fig. 4. Left: President Doughty throws switch to start the generators, which escaped damage, to charge the batteries, shown in Fig. 5 above, which were salvaged from the fire

With the assurances from its insurance broker that the loss was covered by its policies, plus the fact that the casting and pasting department, machine shops, generators and shipping department escaped the fire, the company began to lay plans to get back into production as soon as possible.

At this general meeting, authority was delegated to key personnel to handle the following jobs and to follow through until they were finished:

1. Utilities—power, gas, water and plumbing.
2. Temporary Quarters—construction and rental.
3. Processes—direction and construction of acid facilities and production equipment.
4. Office Facilities—space, equipment, etc.
5. Layout and Production Flow —determine what remained, plus conversion of shipping room to small power battery assembly.

Immediate negotiations were begun to obtain temporary production and office facilities in nearby properties. Production space was leased in one of the plants of the Alan Wood Steel Co., about a block away from the C & D plant.

Quaker Chemical Products Co. offered C & D the use of a building on Elm Street which was accepted for office, sales, and administrative space. Additional office space was made available in another portion of the Alan Wood plant.

General help from other friends, neighbors, customers and suppliers, made it possible for C & D to get back into production much sooner than might have been possible. Following are a few examples of the many offers C & D received to help them get back on their feet: neighboring industries offered manpower and floor space at personal inconvenience; competitors offered to help on critical production; employees were willing to work without pay to get plant cleaned up; customers called and stated they were willing to wait for their orders to be filled; and suppliers gave C & D top priority on critical equipment.

With everyone busy running from place to place to get things done, they found it necessary to hold a progress meeting daily at 1:30 to compare notes and check with each other over the jobs they were able to take care of the previous day and to determine what loose ends still needed attention.

Monday, November 30 — Before any cleaning up could be done, it was necessary to make a physical inventory of the equipment to determine the loss. Insurance adjusters moved right in and made this inventory. They began their work on Monday, November 30, and were finished with the entire physical inventory of the plant in three days.

Outside contractors were immediately engaged to board up sections of the plant which could still be used for production. The one wing shown in Fig. 6 was salvaged first. With the one wall boarded up and the sashes on the opposite side reglazed, they were able to move the batteries saved in the fire over to this section and put on charge. This section was finished by Wednesday.

Tuesday, December 1 — Utility lines were connected and work started on cleaning up the salvageable portions of the plant. Suppliers gave C & D priority on new equipment and materials started rolling in. By December 1, the administrative and clerical forces were working at the Elm street building supplied by the Quaker Chemical Co.

Wednesday, December 2 — By noon, Wednesday, C & D was back in the battery business. Figure 4 shows President L. A. Doughty closing the main switch to start the

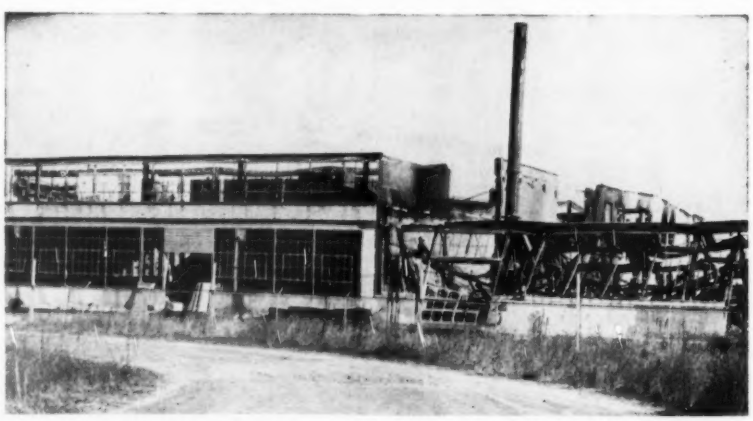


Fig. 6. This view shows the exterior of the wing which was salvaged. Only the first floor was saved. The right hand corner of this building is shown in Fig. 5

charging of the batteries. The motor generator was used to charge the large power stationary batteries (100-1680 amp hour) which were saved in a portion of the charging room. Although the generators were salvageable, they were wet and required drying out with portable heaters.

It was also necessary to set up temporary lines of electric power, water and gas to the casting and pasting department which escaped the fire. This was accomplished with the help of outside contractors and the department was making grids and plates again on December 2.

A partial shift was operating in the casting department on December 3 and a full shift was on the line on Friday, December 4. They were able to go to two shift operation on December 7, which is normal production for this department —exactly one week after the fire. With this department in operation, 30 per cent of the productive labor of the plant was in operation.

While these sections of the plant were getting back into production, men busied themselves in those sections of the plant partially or totally destroyed by the fire. They salvaged dies and fixtures necessary for battery operation so that they could go back into partial production by December 9, with two shift operation by December 15. This brought their total productive labor to 45 per cent.

A line for the small power stationary batteries (100 amp hr) was set up by converting the shipping room, which escaped the fire, into an improvised assembly line. The company arranged for the release of the batteries which were on the floor and readied them for shipment.

Temporary lines were strung to restore a-c and d-c power, water, gas, oxygen and acid facilities to this section. Installation of charging circuits and building of new assembly racks, tables, improvised conveyors, etc., was begun.

Production of the small power batteries was begun on December 11 and went into two shifts on December 15. This additional production added 15 per cent more productive labor, or a total of 60 per cent.

Production on the large power telephone batteries started on December 9 and on small power telephone batteries on December 11. Industrial truck battery production began on December 15. The major part of this production is being performed in temporary or leased facilities, and necessitated acquiring and installing complete production and power facilities. This included generators, controls, transformers, acid equipment and charging lines, etc.

The industrial or motive power batteries (100-1200 amp hr) are being assembled in the new temporary quarters of the Alan Wood plant. C & D started moving into the Alan Wood plant on December 2. It was necessary, however, first to remove the idle steel mill machinery before it could consider assembling the motive power batteries.

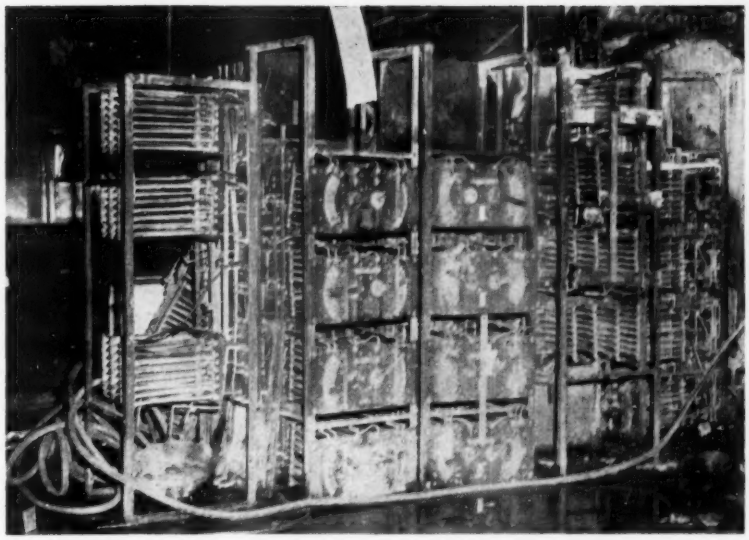


Fig. 7. Charging panels were moved to one section of the plant. They were later checked over to determine the extent of damage and what repairs were necessary

The Alan Wood people were very helpful in arranging to have the equipment removed from the plant. After this was done, C & D repaired the floor where necessary and arranged to install a-c power plus transformers.

With the installation of temporary gas, oxygen, acid and water facilities, plus motor generators and charging panels and associated equipment the complete production and heating equipment, complete production of one line operation was possible on December 17. Two line operation was possible on December 18, with two line, two shift (full operation) assembly on December 21. This added another 40 per cent productive labor for a total of 100 per cent.

When the company held its first meeting on Sunday, eight hours after the fire, it had figured on being back in operation by December 23. As it turned out, it was back in full production, with operations in three different locations, by December 21.

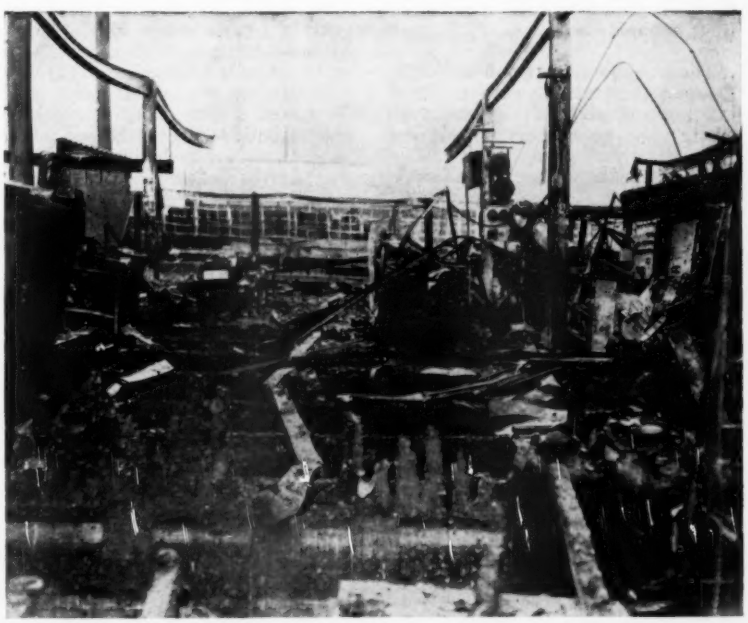


Fig. 8. This is what was left of the research laboratory. The laboratory, in addition to the office and engineering areas, was completely destroyed by the fire

Fig. 1. Old rectifier building was rigged with a third floor thus gaining 32,000 sq ft of floor space for new administration unit

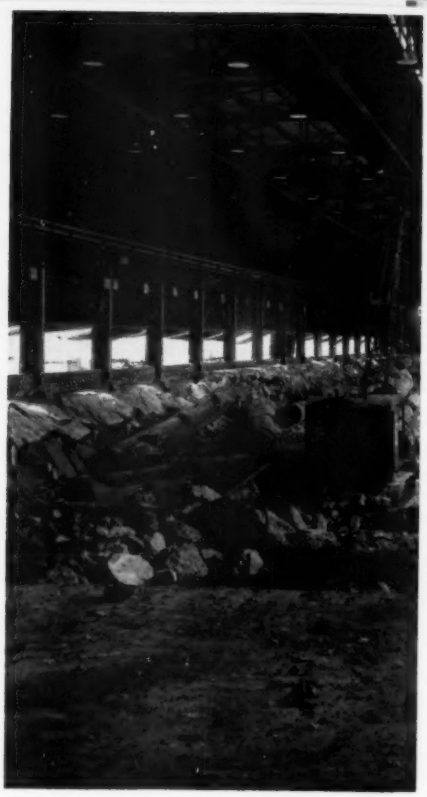


Fig. 3. Typical pit kiln being shoveled basement, covered with floor slab. Space

PLANT CONVERSION — Aluminum to Aircraft

EVER SINCE World War II's end an ugly black hulk of a plant—nearly 800,000 sq ft of it—has stood idle in Torance, Calif. It had been built by the Defense Corp. for Alcoa but had barely shifted into production before VJ-Day shut it down. Its layout—a series of eleven 800-ft. long pot sheds—was so specialized that conversion to other manufacture seemed economically impossible.

Then, suddenly, in April 1952, Douglas Aircraft Co's Plant Engineering and architects got to work. Their aim: to convert at low cost those idle 800,000 sq ft, expand them to 1,300,000. Two months later, with reconstruction in full swing, Douglas' El Segundo began turning out aircraft components for the plant's new owners—the Navy. Before year's end 10,000 aircrafters will be at work in the plant that nobody wanted.

Reconstruction highlights: (1) "gained" more than 500,000 sq ft by linking sheds, roofing over 50-ft. wide areas between them; (2) Reconverted at about half what same floor area and facilities would have cost to build new; (3) Raised 900-ft long, 75-ft wide longitudinal aisle area 12 ft by splicing onto existing column.

This increased headroom to 28 ft 6 in.—sufficient for material handling—compared to former 18 ft 9 in. clearance; (4) Moved a 60 by 200 ft steel framed, roofed and sided factory building across the property, relocated and rebuilt it at one-half estimated replacement cost. The move and restyling required but 90 days; (5) Converted to storage basements three 360 by 100 ft wide, 9 ft 9 in. deep kiln pits, thus gained additional 72,000 sq ft—and at nominal cost; (6) Retained shell of old rectifier building, an odd-sized 960 by 32 by 36 ft high brick and steel-framed structure, remade into a three-floored main administration building at cost of but $1,000,000, fully equipped. In process, gained 32,000 sq ft by addition of third floor within same shell. The administration building's 96,000 sq ft were converted and furnished at about $10 a sq ft.

Result of all this engineering and design is a new defense plant, likely among the 25 largest on the West Coast.

Built into the reconversion is a relatively new and growing theory about plant management. But first, let's take a look at what Douglas El Segundo and the Navy's Bureau of Yards and Docks had to work with.

The aluminum plant—a highly specialized creature of modern in-

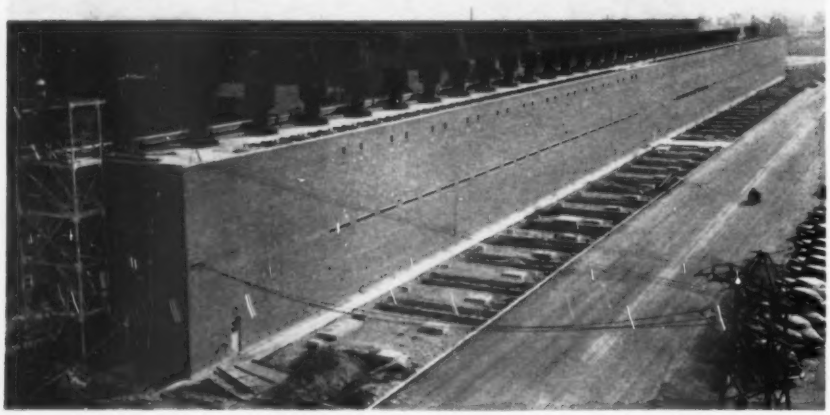
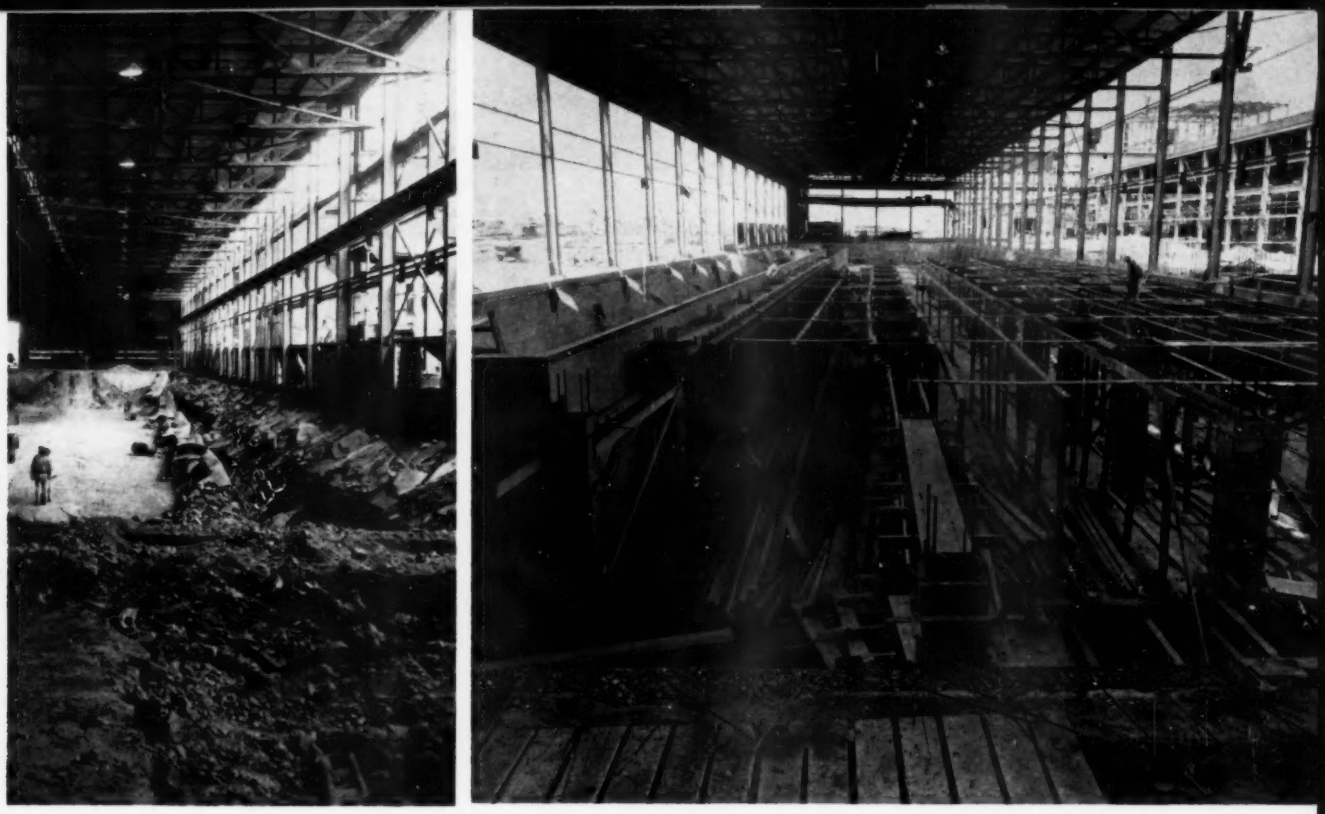


Fig. 2. Rectifier building is now administration building for the Torrance plant



out so that it can be converted into storage was thus added to plant at a nominal cost

Fig. 4. Concrete columns rise from old pit kiln floor to support new first floor slab. Storage basement added 72,000 sq ft of low-cost storage space to Torrance plant

dustry—sprawled over 176 acres in a series of parallel sheds, running east and west. Each of the eleven sheds was about 800 ft long, 46 ft wide. Between each was an uncovered 50-ft wide area. Running longitudinally down the center and along both east and west wings were connecting aisles—the center 39 ft wide, the end passageways 57 to 75 ft wide. To gain floor area, designers roofed over five of the adjacent open areas, creating a single main fabrication and assembly building.

North of these sheds stood three covered pit kilns—each about 360 ft long. They too were separated by open areas—to help dissipate the terrific heat generated in the baking of carbon electrodes.

Instead of abandoning the kiln-pits, the debris was shoveled out, the pits floored over, converting their 108,000 sq ft to storage basements. This was a practical move since pits were 10 ft deep, their sides and bottoms fire-bricked and backed with 18 in. of concrete. The fire-brick was discarded, the pits cleared to their concrete linings, and connected by tunnels. From the salvaged basement floor were poured 2 ft square concrete columns, supports for the new first-floor slab. Part of one pit was poured with inertia blocks to hold heavy forming machines. Even so, Douglas picked up a whopping 96,000 sq ft—a sizable bonus.

Truss connecting once isolated sheds gave plant engineers unidirectional production flow, neatly column-divided into fabrication areas. Flow is from west to east. Final assembly is located near the easternly 75 ft wide connecting aisle which runs the plant's half-mile length. This was the aisle raised 12 ft by splicing on 12 in. wide flange, 53 lb beams—so the corridor could handle large assemblies. In construction, the structure was raised on hydraulic jacks, cribbed and the extensions welded to existing columns.

"You could call it routine," admits Ass't. Plant Engineer L. D. Bisher, "but the method of the heightening certainly wasn't run-of-the-mill."

Reconversion, according to R. A. Myers, Works Manager of the Douglas El Segundo Division and Torrance-location superintendent J. D. Thomas, dovetailed into a growing concept of production: localized responsibility. Or, put another way: "centralization of responsibility as opposed to specialization of operation."

It is their contention (and many another plant supervisor agrees) that over-specialization is wasteful.

Recently in an exclusive interview, Messrs. Myers and Thomas explained their theory. "Specialization, while sound and necessary, can go too far. We still need specialization and closely-knit grouping where high-priced machinery is concerned. But specialization, especially where it means that raw materials are 10 miles from the plant, fabrication 5 miles away, special processing 2 miles, etc., builds up a tremendous amount of paperwork. Coordination begins to look like logistics. Somehow, lost in the shuffle, is that necessary ingredient—'personalization,' the feeling of 'belonging' to a given project, in a given area. 'Belonging' to the plant as a whole doesn't give that same spirit of teamwork."

This "feeling," contend Myers and Thomas, is going to be an important production tool, especially when the new plant's employment swells to 10,000.

As Thomas continued, "Now, take this reconverted Alcoa Plant. It wasn't designed for aircraft production. It wasn't built to handle assembly lines engaged in divergent production. Nor was it designed with fabrication in mind. Yet, ironically, it fits snugly into the concept that you've got to localize responsibility. We're going to try to make each project manager his own team-captain, as self-sufficient as possible. We're going to assign each project manager his own bay—his 'own house'—and an adjacent storage area (the roofed-over area between his bay and the next).

"The passageways and original building walls nicely divide buildings into project sections. Then we've built five dining room-administrative office wings—one off each section. Employees from one section will eat together. Above the dining

(Continued on page 152)

GEARMOTORS— Their Selection and Application

Advantages of standard speed units . . . Establishing load requirements . . . Three service classifications . . . Allowing for overhung load . . . Mounting positions . . . Lubrication . . . Maintenance

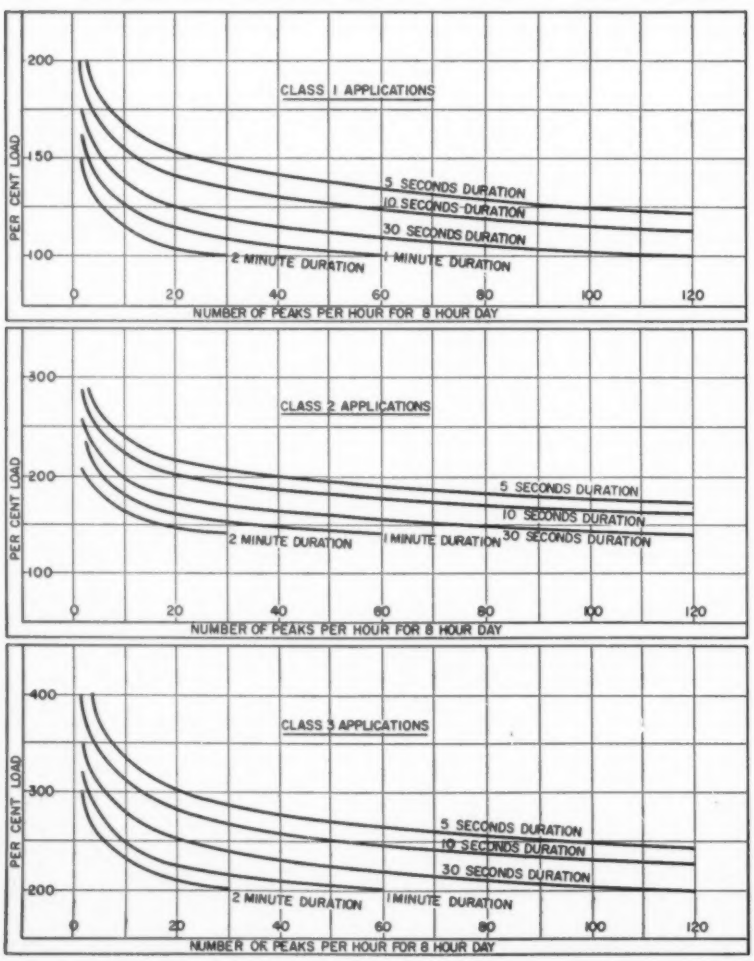
By C. E. KNOER, Gearing Division, Westinghouse Electric Corp.

MOTORS WITH TEETH—to virtually bite into your speed reduction problems—that, essentially, is the gearmotor. Today's integral horsepower package is a far cry from those offered some years ago during the original development of the gearmotor. Those units were designed for a few special cases where it was considered possible to combine high speed motor parts with gearing parts to service specific applications. Today, the "specials" are the exceptions to a long line of standard stock units, available to industry through numerous manufacturers.

There are some who believe the gearmotor has reached its limit of usefulness. On the contrary, the future of these packaged drives looks every bit as promising as did their past. Industry not only accepts, but is enthusiastic about the gearmotor. This fact is evidenced each day as industry presents its problems to the many manufacturers of gear drives. In line with modern progress, such problems as space limitation, appearance, high speeds, sound level, peculiar duty cycles, and many others are constantly being solved. As each of these hurdles is overcome, the long list of standard units will become even longer, commensurate with the demand.

This situation has been greatly aided by the guiding influence and progressive leadership of the American Gear Manufacturer's Association. This organization, through the composite thinking of its members, has set up standard design formulae, material stress limitations, gearmotor classifications, standard output speeds, and application procedures. As a result, it is now a rather simple problem for the application engineer to specify a gearmotor with accuracy and confidence.

Fig. 1. Allowable peak loadings for gearmotor for peaks of indicated durations



Output Speeds

In selecting a gearmotor, a point of prime interest is the required output speed. Table I indicates the standard output speeds adopted jointly by AGMA and NEMA. The actual output speed may vary plus or minus 3 per cent from these values, the permissible variance allowed the gearmotor manufacturer.

The speeds shown are normally obtained through one, two, or three stages of reduction.

Many intermediate speeds may also be obtained, but usually at a slight extra cost. It is interesting to note that each successive standard speed is based on a multiple of 1.225. That is, if any listed output speed is divided by this factor, the next approximate lower output speed is obtained. When the engineer is selecting a speed, it will prove advantageous to choose a standard one for several reasons:

(1) Gearing for standard output speeds is more readily available.

(2) Standard gearing usually permits a simple and economical change in speed, if necessary, at a later date.

(3) Standard output speeds are obtained at no additional cost.

Load Requirements

It is essential that the load requirements of the driven equipment be established. The required horsepower may be based on oscillograph or wattmeter readings taken of similar equipment, or it may be closely estimated from past experience or performance data.

Work to be accomplished by the gearmotor can be segregated into 3 steps:

(1) Work necessary to overcome friction in the driven equipment.

(2) Work necessary to perform the actual operation.

(3) Work necessary to overcome inertia forces.

The last of the above three steps is basically as simple as selecting a motor only, and usually not of any great importance because of the low output speeds normally associated with gearmotors. The engineer will not, however, go amiss in giving consideration to the point.

Gearmotors, although basically designed to transmit a certain torque, are not sold on this basis, but rather by horsepower rating at specific output speeds. A look at the many gearmotor publications will reveal that for a given horsepower rating, the unit size becomes larger as the speed decreases. This bears out that the design is predicated on torque capacity at a given output speed. A glance at the formula below will show that, for a given torque, as the rpm decreases the horsepower also decreases and that the inverse is also true:

$$\text{Torque} = \frac{\text{Horsepower} \times \text{Constant}}{\text{Output rpm}}$$

Having determined the load requirements of a gearmotor, it is still not possible to establish the final unit size. The duty cycle involved and the time of operation must be taken into account. This is necessary to establish the proper service class.

Service Classes: The AGMA has set up for the industry a most comprehensive Recommended Application Practice, for parallel shaft type gearmotors, into three service classifications.

Class I—For steady loads not exceeding normal rating of motor and 8 hours a day service. Moderate shock loads where service is intermittent.

Class II—For steady loads not exceeding normal rating of motor and 24 hours a day. Moderate shock loads for 8 hours a day.

Class III—Moderate shock loads for 24 hours a day. Heavy shock loads for 8 hours a day.

Table II is a listing of well over 100 typical applications recognized as standard by AGMA and accordingly included as part of its recommended application practice.

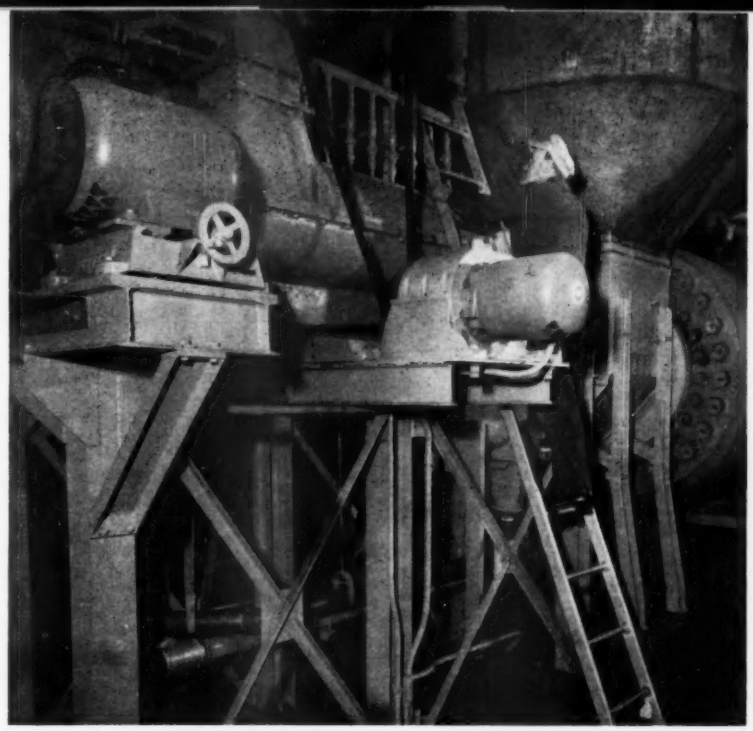


Fig. 2. Class I unit, installed in a brew house, is driving a grain feed arrangement

Where irregularities in load or load fluctuations are known, the accompanying graphs indicate the allowable peak loading for gearmotor applications for a varying number of peaks of given duration. It will be noted from these curves that the intensity of allowable shock varies inversely with the frequency of the peaks. These curves are in essence based on the durability rating of a gear set and are proposed to limit the frequency and amplitude of peak loads so that a satisfactory gear life may be obtained.

Determining Load

In most applications the durability rating of a set of gears determines the allowable load, since the gear teeth are ordinarily made strong enough by the selection of suitable pitches and materials to insure against tooth breakage. However, there are a relatively few applications, such as various types of hoists, where the gears operate infrequently or with comparatively long periods of shutdown between each operation. In these instances, the durability rating becomes secondary and the gearing should be selected on a peak torque or strength basis. Since such applications require special consideration, it is usually desirable to refer them to the gearmotor manufacturer for review and recommendations.

Too often gearmotors are selected quite satisfactorily with respect to matching the load and service requirements, but with little or no regard to the allowable overhung load that may be imposed on the output shaft. Various factors will influence the intensity of an overhung load, such as:

(1) The method of power takeoff (Chain, V-Belt, Flat Belt or Pinion).

(2) The pitch diameter of sprocket, pulley, or pinion.

(3) The output speed of the gearmotor.

If the information covering the foregoing points is available, the overhung load may readily be calculated by the use of the following widely accepted expression:

$$W_t = \frac{63{,}000 \times P \times S.F.}{N \times R_p} = \frac{T}{R_p}$$

Where:

W_t = Tangential Force— lb; P = Transmitted Horsepower; N = Speed of Output Shaft—rpm; R_p = Pitch Radius of Pulley, Sprocket, or Pinion; T = Torque at Output Shaft in lb in.; S.F. = Service Factor.

Table I. Standardized full load output speeds, for 60 cycle and d-c integral horsepower gearmotors, AGMA and NEMA

Gear Ratio	Motor rpm 1750	Gear Ratio	Motor rpm 1750	Gear Ratio	Motor rpm 1750
2.24	780	11.3	155	58.3	30
2.73	640	14.0	125	70.0	25
3.37	520	17.5	100	87.5	20
4.17	420	20.8	84	106.	16.5
5.00	350	25.7	68	130.	13.5
6.25	280	31.2	56	159.	11
7.61	230	38.9	45	194.	9
9.21	190	47.3	37	233.	7.5

Table II. Information on which class of gearmotor should be applied to many different types of industrial equipment

APPLICATION	8-10 Hr Service	24 Hr Service
Agitators		
Pure liquid	I	I
Variable density	II	II
Blowers		
Centrifugal	I	II
Lobe	II	II
Brewing & Distilling		
Bottling machinery	I	II
Brew kettles, continuous duty	II	II
Cookers, continuous duty	II	II
Mash tubs, continuous duty	II	II
Scale hopper (frequent starting peaks)	II	II
Car Dumpers	II	III
Car Pullers	II	III
Clarifiers	I	II
Classifiers	II	II
Clay Working Machinery		
Brick press	III	III
Briquette machine	III	III
Clay working machinery	II	II
Plug mill	II	II
Compressors		
Centrifugal	I	II
Lobe	II	II
Reciprocating — Multi-Cylinder—Adequately fly-wheeled (within 3% cyclic variation)	II	III
Reciprocating — Single cylinder	Refer to Mfr.	
Conveyors (Uniformly loaded or fed)		
Apron	I	II
Assembly	I	II
Belt	I	II
Flight	I	II
Oven	I	II
Screw	I	II
Conveyors (Heavy duty or dual drive —not uniformly fed)		
Apron	II	II
Assembly	II	II
Belt	II	II
Flight	II	II
Oven	II	II
Screw	II	II
Reciprocating	III	III
Shaker	III	III
Cranes & Hoists		
Main hoists — medium duty	II	II
Main hoists—heavy duty	III	III
Skip hoists	II	II
Travel motion	II	II
Trolley motion	II	II
Dredges		
Cable reels	II	II
Conveyors	II	II
Cutter head drives	III	III
Jig drive	III	III
Screen drive	III	III
Dredges—Continued		
Stackers	II	II
Utility winches	II	II
Elevators		
(Conveyor Type — same as conveyors)	Refer to Mfr.	
Freight		
Passenger		
Fans		
Centrifugal	I	II
Cooling towers	II	II
Large (mine, etc.)	II	III
Light, small diameter	I	II
Food Industry		
Beet slicers	II	II
Cereal cookers	I	II
Dough mixers	II	II
Meat grinders	II	II
Hoists—See Cranes		
Laundry Washers	II	II
Laundry Tumblers	II	II
Line Shafts		
Driving processing equipment	II	II
Other line shafts	I	II
Machine Tools		
Punch press (gear connected to load) and shears	III	III
Notching press (belt driven)	I	II
Plate planers	III	III
Other machine tools—main drives	II	II
Auxiliary drives (Feed-Traverse, etc.)	I	II
Metal Mills		
Draw bench carriage and main drives	III	III
Forming machines	III	III
Pinch, dryer and scrubber rolls (reversing)	Refer to Mfr.	
Slitters	III	III
Small rolling mill drives	III	III
Table conveyors (non reversing)	II	II
Table conveyors (reversing)	Refer to Mfr.	
Wire drawing and flattening machines	III	III
Mills (Rotary Type)		
Ball	III	III
Cement kilns		III
Dryers and coolers		II
Hammer	III	III
Kilns	II	III
Pebble	II	III
Rod	III	III
Tumbling barrels	III	III
Mixers		
Concrete mixers — continuous duty	II	II
Concrete mixers—intermittent duty	I	
Constant density	I	II
Irregular density	II	II
Oil Industry		
Oil well pumping (not over 150% peak torque)	III	III
Refineries		
Chillers	II	II
Paraffin filter press	II	II
Rotary kiln	II	II
Paper Mills		
Agitators (mixers)		II
Bleachers		II
Beaters and pulpers		III
Calenders		III
Conveyors		II
Couch		III
Cylinders		II
Dryers		III
Felt stretchers		II
Jordans		III
Presses		III
Stock chests		III
Suction rolls		III
Winders		II
Rubber Industry		
Mixer	III	III
Calenders	II	III
Mills	III	III
Sheeters	III	III
Tire building machines	II	II
Tire and tube press openers	I	I
Tubers or strainers	II	II
Pumps		
Centrifugal—with surge tanks or equivalent	I	II
Centrifugal—without surge tanks	II	II
Gear and rotary—constant density fluid	I	II
Gear and rotary — variable density fluid	II	II
Proportioning pumps	II	III
Reciprocating—with open discharge	I	II
Reciprocating — multi-cylinder, double acting	II	II
Reciprocating — single-cylinders	Refer to Mfr.	
Sewage Disposal Equipment		
Inside service	I	II
Screens		
Rotary—stone or gravel	II	II
Traveling water intake	I	I
Textile Industry		
Batchers	II	II
Calenders	II	II
Card machines	II	III
Dry cans	II	II
Dyeing machinery	II	II
Looms	Refer to Mfr.	
Tenter frames	II	II
Mangles	II	II
Nappers	II	II
Soapers	II	II
Spinners	II	II

Table III. Viscosity in SUV Seconds

Lubricant No.	At 100 deg	At 210 deg
2	280-360	—
3	490-700	—
4	700-1000	—
5	—	80-105
6	—	105-125
7	—	125-150
8	—	150-190

Having obtained a value of tangential force (W_t), this value must be multiplied by one of the following factors to arrive at the imposed overhung load on the output shaft: Chain—1.0; V-Belt—1.5; Flat Belt —2.0; Pinion—1.25.

By referring to any number of gearmotor catalogs it may readily be determined whether the calculated overhung load value is within the permissible limits of the gearmotor selected. These permissible values are usually listed by horsepower and output speed and apply to any gearmotor made in accordance with AGMA standards.

Other Factors in Selection: Although there are many other factors entering into the selection of a proper gearmotor, it is not the basic intent of this article to elaborate on them all. It is felt worthwhile, however, to briefly comment on a few of the more important considerations.

Motor Consideration

Among the many types of motors that may be adapted to a gearmotor we find such types as — constant speed, variable speed, multi-speed, intermittent rated, high torque, and high slip motors. A wide range of enclosures are also available. Some of the more common ones are—open protected, totally enclosed, splash-proof, fan cooled, force ventilated, and explosion proof. To these motors there are also many special features that may be adapted, including various types of brakes, speed switches, heaters, thermoguards, tachometer generators, among others. With all these possibilities, it may readily be seen that a gearmotor is very versatile.

Various Mounting Positions: Most manufacturers of gearmotors will furnish units for mounting in horizontal-floor, ceiling, right-hand wall, left-hand wall and various angle positions. In regard to mounting, there are times when space is at a premium in adapting the drive equipment to the driven machinery. Gearmotor catalogs contain standard dimension sheets, wherein the engineer may ascertain whether the selected gearmotor will fit into the allotted space.

In some instances it may be found that the unit selected is not entirely as anticipated, but this should not be the reason to eliminate this unit from consideration if all other features of the units are desirable. Such cases should be referred to the manufacturer for review giving the necessary data on available space. Often, slight and inexpensive modifications may be made to render the unit suitable.

Lubrication: It is, of course, desirable to utilize a unit which offers a lubrication system as efficient and near foolproof as possible. The widely used and highly acceptable splash lubrication system employed in most gearmotors usually provides the answer to satisfactory lubrication. There are certain applications, such as very slow speed drives or drives which are mounted in odd positions, where it is not practical to rely solely on the splash system. In such instances, slight supplemental modifications can be made to render an effective lubricating system.

The lubricating oils used with gearmotors are of the straight mineral type and are required to be high-grade, high-quality, well refined petroleum oils. Since no "highly special" oils are required, procurement offers no problem. Many gearmotor manufacturers will, upon request, furnish a list of AGMA approved oils which meet the general specifications shown in Tables III and IV.

Table IV. Lubrication recommendations various degrees ambient temperature

AMBIENT TEMPERATURE DEGREES F		
0-40 deg	41-100 deg	101-150 deg
Lubricant No. 2	Lubricant No. 4	Lubricant No. 5

For applications where loads, speeds, or temperatures are abnormal, the gearmotor manufacturer should be contacted for specific recommendations.

Ease of Maintenance

It is a rarity when any manufacturer will readily admit that his product will at any time require servicing. However, being realistic about the matter, one must admit that the possibility of failure does exist. Therefore, in selecting a gearmotor, serious consideration should be given to the design, with respect to the ease with which it may be serviced. This will prove invaluable for several reasons:

(1) Simplicity of design encourages positive periodic preventive maintenance action.

(2) Ease of dismantling minimizes the cost of repair should failure occur.

(3) Ease of assembly will permit a better repair job when failure does occur.

In approaching any gearmotor selection problem, the engineer's time will be well spent in giving sufficient and proper consideration to the points mentioned herein. He will then be definitely assured of a "package of power" that will prove highly efficient and trouble-free.

Fig. 3. This Class III gearmotor is driving a coal conveyor at Windsor Power House Coal Company in West Virginia

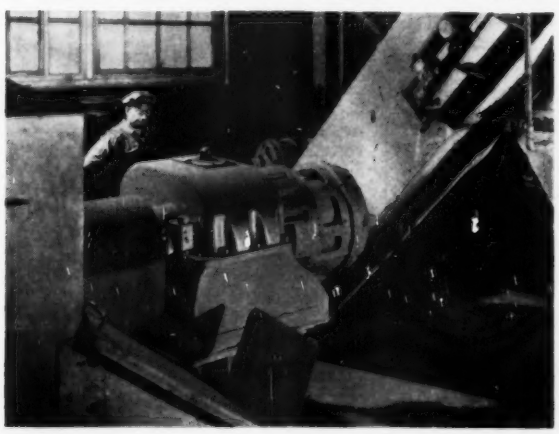
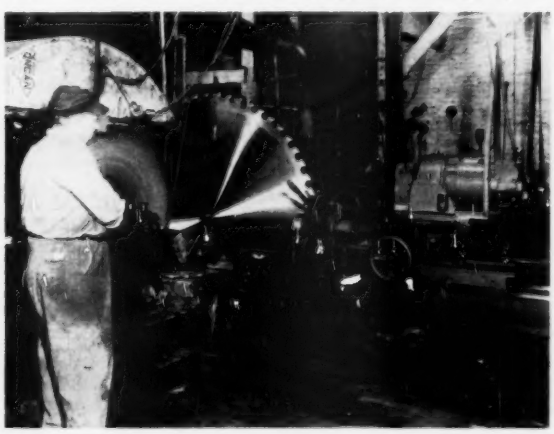


Fig. 4. Gearmotor driving a grinder for sharpening 72 in. circular saws at the E. C. Atkins Company, Indianapolis, Ind.



International Harvester Checks Machine Repairs Daily

By keeping a daily check on repair records, International Harvester is able to shift repairmen to get a machine that has a priority classification back in operation

By P. C. BOOTY, Works Manager, West Pullman Works, International Harvester Co.

BECAUSE OF THE various types of machines that the West Pullman Works has to maintain to supply the other International Harvester Plants with bolt and nut products, ball bearings, carburetors, and many other products, it is important that we have up-to-the-minute information on machines down for repairs and the number of man-hours required to put them back on the line.

We have devised a record system which gives this information on short notice. By keeping a daily check on these repair records, we are able to shift repairmen from one job to another in order to get a machine that has a priority classification back in operation.

In order to best service the many types of equipment — boltmakers; automatic screw machines, both single and multiple spindle types; raceway grinders, and drill presses—we have broken down the repair operations into several divisions.

The Machine Repair Department, a section of the Mechanical Engineering Department, has been divided into groups of repairmen which are stationed in each major manufacturing division, and a shop section, where repair parts are machined and fabricated.

Each repair group is headed by a working group leader who directs the operations of the repairmen in his unit. This leader is the primary contact between the Manufacturing Department foreman and the Machine Repair Department. He receives the repair orders from the manufacturing foreman, inspects the machine to be repaired, assigns the repairmen and, as required, aids in returning the machine to operation as quickly as possible.

The largest of these groups is stationed in the Heading Section of the Bolt and Nut Department. This unit normally consists of 10 men who maintain the approximately 80 machines in this area.

Records Tell the Story

As the plan is set up, the records flow from the group leader through the machine repair general foreman's office to the mechanical engineer's office. These records consist of a Down Time Report, a Master Control Chart and a Machine Group Control Chart. Preparation and processing of each report is discussed in the following paragraphs.

The Down Time Report, Fig. 1, is prepared each day by the Group Leader, showing the type and number of each machine requiring repair. The report also denotes whether a machine is down for the first time or carried over from the preceding day by showing the date the machine was reported for repair and an estimate of the man-hours required to complete the job. The leader also makes a brief description of the repairs required, and on each day a running report shows the progress made, such as, disassembly of the machine, what parts are being processed in the shop, etc. When the repairs have been completed, he indicates the date and time the machine was returned to operation.

The leader turns the Down Time Report into the Machine Repair Office at the end of each first shift. The information is reviewed by the Machine Repair Foreman, who then prepares an original and one copy of the leader's report, adding to the remarks, if necessary. The foreman also enters the number of hours charged to the Heading Departments by the Machine Repair Department. This information is obtained from the time cards prepared by each repairman and turned in at the end of the shift.

Copying the report and totaling the repair hours may seem to be a clerical task added to the many duties of the foreman. Actually approximately ½ hour each day is consumed as the foreman copies this report at the time he approves the labor tickets. It is to the foreman's advantage to have the information for his use in routing parts requiring machining through the shop as well as answering questions asked by anyone concerned with bolt and nut operations.

The original copy of the Down Time Report is delivered by the foreman to the mechanical engineer's office before 10:00 A.M. The mechanical engineer reviews the repair situation with the foreman, consulting the Control Charts and Down Time Report to revise or set priorities. After this, the Down Time Report is turned over to a clerk who enters the information on the Machine Group Control Charts and Master Control Chart.

A Machine Group Control Chart, Fig. 2, is prepared on a monthly basis for each type of machine in the Heading Division.

When a machine is first reported down for repairs, the estimated hours

DOWNTIME REPORT

MACHINE NUMBER	TIME DOWN	EST. TIME TO COMPLETE	REMARKS	JOB COMPLETE
HEADER		HOURS		
3435 5/8	2/12	20	BROKEN KNOCKOUT LEVER	W.O. IN SHOP
5048 1/2	2/21-11AM	2	BENT SCREW IN PUNCH HOLDER	2 PM. 2/21
NUT				
2597 3/8	2/8	500	OVERHAUL	WORKING ON
BOLTMAKER				
9513 3/8	7:30 AM. 2/21	3	BROKEN PIN IN WIRE DRAWER	11 A.M. 2/21
9898 1/4	10 AM 2/21	4	CHECK WIRE FEEDER	3 PM. 2/21
	TOTAL JOBS 13			
	IN PROCESS 8			
		142 HRS		

Fig. 1. Down Time Report shows the type and number of each machine in for repairs, brief description of the repairs required and an estimate of man-hours

are entered in the square in the chart that falls opposite both the machine number and day of the month. On each succeeding day a code entry, as shown on the legend on the chart, is made to indicate the type of action taken.

The code entries used at West Pullman consist of a check (√) which indicates that labor was performed on a particular machine during the day, an "S" shows that the parts for this machine are being fabricated or machined in the shop, a dash (—) means that no labor was performed during the shift, the letter "W" indicates that the repair is delayed by another department in the plant unable to provide the service, and the letter "P" shows that an outside vendor must provide parts to proceed with the repair. In addition, a small "2" or "3" in the corner of the square indicates that the machine was returned to operation on the 2nd or 3rd shift.

Line graph in the lower right section of the chart shows the number of machines down for repair in each category each day. This chart also gives a graphic picture of the repair level of the machine group for the month.

The control charts are set up on a monthly basis, and machines not completed during the pending month are designated by entries in the carry-over column, showing the estimated hours and date the machine was first reported down for repairs. This entry makes the "carried-over" machine stand out and thereby aids in setting priorities.

Master Control Chart, see Fig. 3, is divided into two sections. The upper section indicates the number of man-hours charged to the Heading Department each full day. This includes labor performed in the shop by the lathe hands, grinders, millls or planer as well as the labor of the repairmen located in the department.

The company has found from past experience that when the repair hour level falls below approximately 120 hours per day, the machine down level as shown in the lower section of the chart tends to rise appreciably. The lower section of the graph carries two lines. The upper broken line indicates the number of machines that were down for repair each day. The lower line on graph shows the number of machines carried over to the next day. The area between the lines shows the efficiency of the Machine Repair Department.

By watching the trend of the line on this section of the chart and balancing this against the man-hour level, it is possible to anticipate an overload of repairs and temporarily assign additional repairmen to this group. This chart contains the data most often referred to as the repair situation is reflected from a quick glance at this chart.

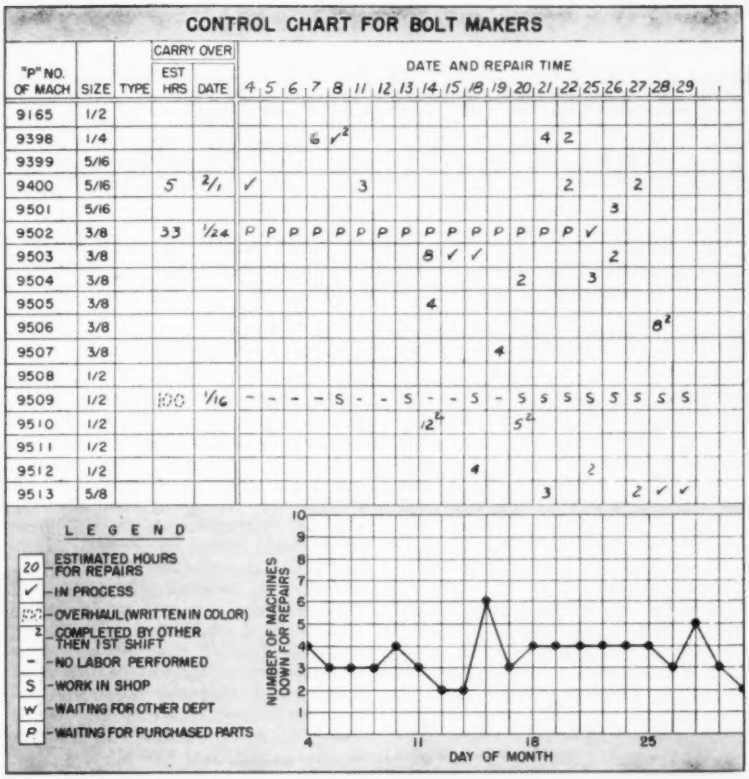


Fig. 2. Machine Group Control Chart is prepared on a monthly basis. The number of machine, date received for repairs and estimate of hours are entered on chart

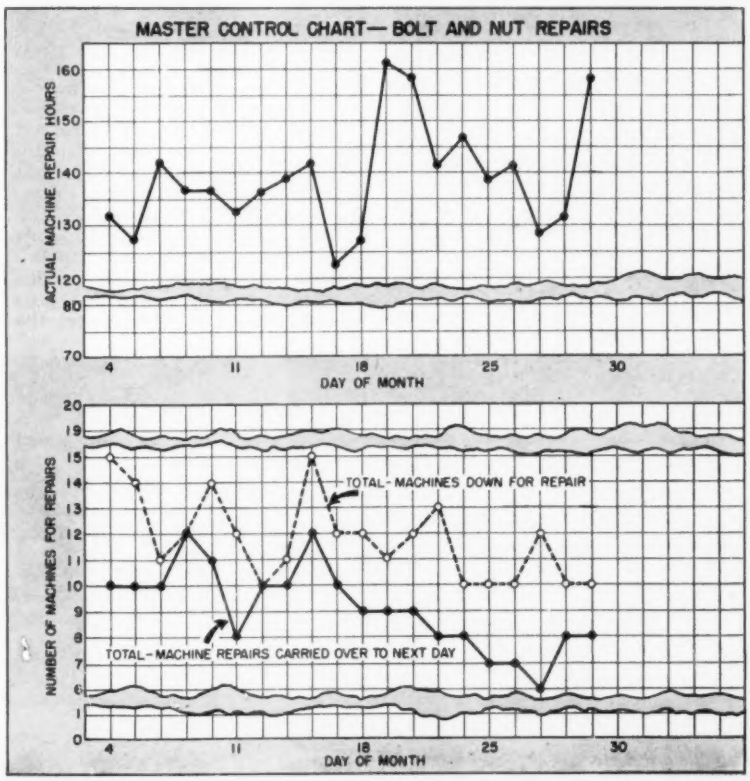

MASTER CONTROL CHART— BOLT AND NUT REPAIRS
ACTUAL MACHINE REPAIR HOURS
DAY OF MONTH
NUMBER OF MACHINES FOR REPAIRS
TOTAL - MACHINES DOWN FOR REPAIR
TOTAL - MACHINE REPAIRS CARRIED OVER TO NEXT DAY
DAY OF MONTH

Fig. 3. Master Control Chart is divided into two sections. Upper section indicates number of man-hours; lower section shows the number of machines down for repair

Planned Defrosting Boosts Cooling Efficiency

Frost build-up on cooling coils seriously affects heat transfer . . . Efficiency drops and cooling costs rise . . . Author outlines several methods of defrosting cooling units

By H. NYE JOSLEYN

RELIABLE, fast methods for defrosting refrigeration evaporators are of major importance in maintaining desired room temperatures without excessive costs. Frost on the surfaces of cooling units serves as an efficient, though unwanted, insulator of heat transfer between the air to be cooled and the refrigerant inside the coil. As frost builds up on the surface, equal cooling effects can only be obtained by resorting to lower suction pressures and greater compressor capacity. Regardless of the temperature within the coil, however, too great a quantity of frost accumulation on the outer surfaces eventually will prevent any effective refrigeration. Also undesirable, the additional weight of frost accumulations, varying from six to 56 lb per cu ft, can provide dangerous loads on normally sufficiently strong hangers.

Defrost on Schedule

Planned defrosting, scheduled so that the work can be done before critical temperature losses take place and carried out with efficient methods, will more than repay the costs involved. The savings in maintaining temperatures without curtailing plant operations or excessively loading refrigeration machinery are sufficient justification for adoption of defrosting methods involving scheduled operations.

Special types and locations of evaporators require individual methods of treatment. Ceiling coils, unit coolers, or boxed-in assemblies in both coolers and low freezers create a necessity for different methods or arrangements of defrosting facilities. Procedures vary, including circulation of hot discharge gas from the compressor, circulation of liquids inside or over the surface of the evaporator, electrical resistance or hand scraping.

Scraping the frost from the coils —while often expedient—is the crudest and least satisfactory method. It is impossible to remove all of the accumulation and a great amount of labor is involved. While properly constructed scraping tools greatly facilitate the work they must be used at frequent intervals to prevent build up of hard frost which cannot be removed manually. (See PLANT ENGINEERING, May, 1953, p. 62.)

Direct expansion and flooded type coils are more readily defrosted by the use of hot gas pumped through a separate piping system directly to the evaporator from the discharge side of the compressor. It is suitably connected to the coil close to either the suction or liquor valve. To assure the removal of entrapped oil and other liquid contaminants in the coil, flow of the hot gas must always be with gravity. On a bottom suction coil the incoming hot gas line is connected near the liquor valve, on a top suction coil the gas is circulated from the suction end. See Fig. 1.

To defrost with hot gas, first pump the evaporating coil reasonably dry of active refrigerant. Close off the suction and liquor valves, then open the hot gas valve and build up pressure to a minimum of 50 psi. Provide circulation for the hot gas, condensed gas and entrapped oil by cracking the valve on the opposite end of the coil. Satisfactory results are obtained by having sufficient hot gas flow to maintain the minimum pressure together with enough circulation to adequately remove accumulated liquids.

When circulation is from the evaporator into the liquor line, provide suitable valving to direct the

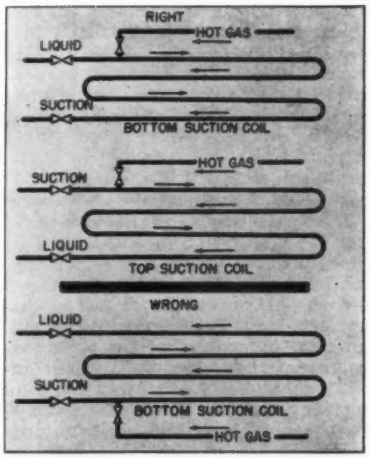


Fig. 1. Right and wrong ways to hook up hot gas recirculating lines to defrost direct expansion and flooded type coils

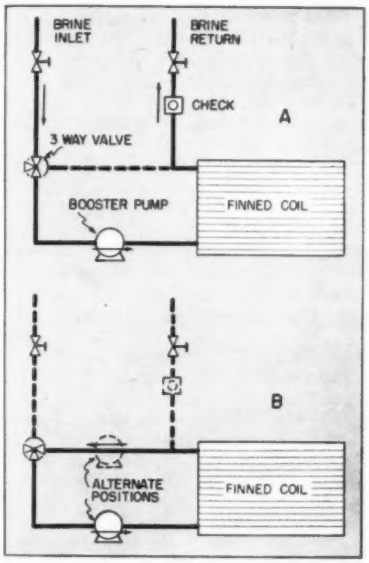


Fig. 2. Booster pump in brine line circulates brine through coils to warm it. A, normal circulation; B, defrosting flow

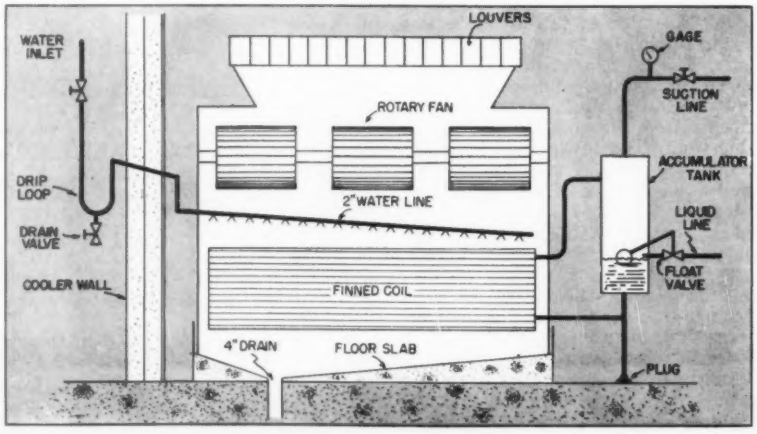


Fig. 3. Two-inch water line provides spray over coils in unit cooler operating at -50 F. Drip loop inserted at room temperature location to prevent freezing

flow to a trap or other evaporator more readily available for the separation of refrigerant and removal of oil. In circulating into the suction line regulate the flow so as not to overload and damage the compressor. Oil drawn back to the compressor in this manner, if not suitably trapped, may be recirculated with the liquid refrigerant and cause a dampening effect on the entire system. Circulation of the hot gas must progress rapidly, particularly in low freezers, to prevent its condensing and accumulating in sufficient quantities to choke up the coil and block the defrosting.

Coils cooled by brine circulating internally are defrosted by flushing with a continuous non-freezing spray or by warming the brine in the pipes. Various methods are suggested to fit individual requirements.

In sharp freezers or rooms held below freezing, brine coils are defrosted by heating of the circulating brine in the pipes. Carried in a separate pipe line, the brine is warmed in a centrally located tank. Another arrangement utilizes a portable auxiliary brine heater equipped with a pump and electric heating elements, connected directly to the coil by means of unions and flexible hose.

Where relative humidity must be controlled and where controlled spraying is not advisable results can be obtained by recycling of the brine in the coil. The refrigerant is recirculated until it reaches room temperature and melts off the accumulated frost. Recirculation by cycling is controlled automatically by the use of a three way valve and pump. Action of the valve shuts off the incoming refrigerant and the pump recirculates the brine already in the coil. See Fig. 2.

Dry finned-type unit coolers used to hold blast freeze tunnels down to as low as -50 F are efficiently defrosted by the periodic use of ordinary "cold" water. At a temperature of 45 F or higher, water under 60 psi pressure is distributed over the coils by a coarse spray from 2 in. pipe headers suspended 10 in. above the coil. To defrost, the liquor and suction valves are closed and the water turned on. As the pressure in the coil comes up to the corresponding temperature of the water, the ice and snow will melt, and be washed away. Experience shows that a large volume of water is of greater value than a higher temperature. The use of warm or hot water is not advisable because of the possibility of building up excessive pressure in the coil. To prevent the spray water pipe from freezing, it is installed at a suitable slope to drain readily, and a drip loop is located near the shut off valve. Drainage of the drip loop prevents any leakage from the shut-off valve entering the spray header or its feed line inside the cold area.

Plant Engineers
Go Back to School — to Teach

PLANT ENGINEERS of the Midwest played important roles in the Industrial Maintenance Institute held on December 9-11 at the University of Wisconsin in Madison, Wisconsin.

T. S. Ramond, of the Goodman Mfg. Co., Chicago, opened the Institute with a paper on "Establishing a Good Maintenance Program." As listed by Mr. Ramond, the basic requirements for good maintenance are: A well organized and efficient crew of skilled employees; A sound inspection system to be resolved into a realistic maintenance program; A carefully supervised method of controlled lubrication; and the offering of advancement opportunity to maintenance personnel through a sound personnel training program.

Consulting engineer C. F. Gebhardt, formerly Maintenance Superintendent at the A. E. Staley Mfg. Co. plant in Decatur, Illinois, discussed "Theory and Practice of Planning and Scheduling Maintenance Work." Highlight of the presentation was the description of a work order system based on daily written instructions to each maintenance worker, and the success of the system as installed at A. E. Staley.

William C. Garrett, of the Thew Shovel Co., Lorain, Ohio, opened the second day's sessions with a presentation of his company's method of maintenance work scheduling, introducing the operation of "flying squads" of maintenance personnel. These groups of tradesmen, comprising a small percentage of the entire crew, are available for emergency jobs as they arise.

D. F. Redman, of International Harvester's West Pullman Works, Chicago, led the afternoon discussion on Maintenance Budgets, emphasizing the part that budgets play in planning maintenance work, and the difficulties involved in obtaining management approval of this apparently non-productive cost.

Final session of the Institute was presided over by W. J. Allaback, also of the Thew Shovel Co. Mr. Allaback explained further the workings of his company's system, as introduced by Mr. Garrett, and covered the record-keeping procedure that is followed. He also injected into the meeting the possibilities and procedures for work measurement in maintenance.

W. J. Allaback, left, and W. C. Garrett, both of Thew Shovel Co., Lorain, Ohio, who presented papers at the Institute

Paul J. Grogan, Institute Director (l), presents award to banquet speaker B. H. Monroe, Pittsburgh Plate Glass Co.

Institute speakers line up for the camera. L to R, T. S. Ramond, D. F. Redman, C. F. Gebhardt, Institute attendee Andy Anderson, Plant Engineering magazine

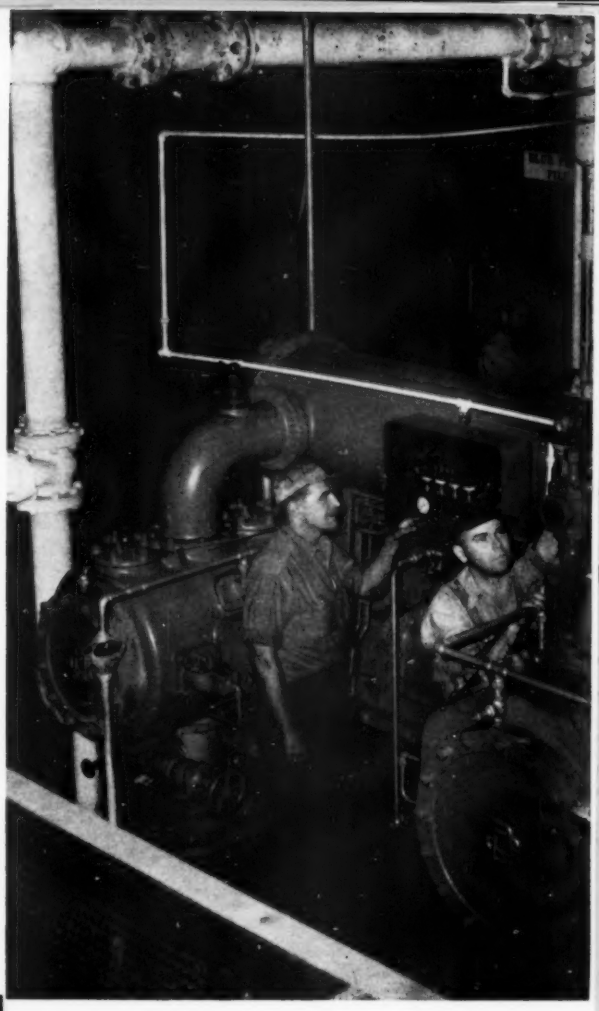


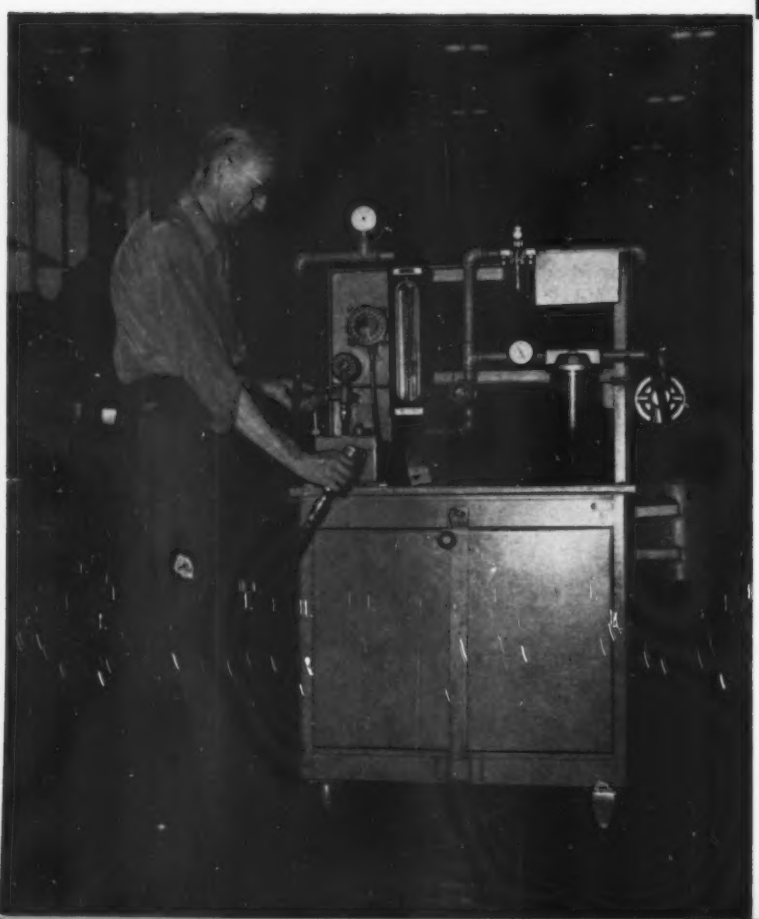
Fig. 2. One of the four compressor stations within the Ryan plant. Demand on the units is for 3600 cfm at 100 psi

COMPRESSED AIR Survey Knocks Wind Out of Losses

Decreased repairs, increased efficiency, longer life for tools, plus $240,000 annual saving, prove the pudding

By JOHN ROUSH, Methods Engineer
Ryan Aeronautical Company, San Diego, California

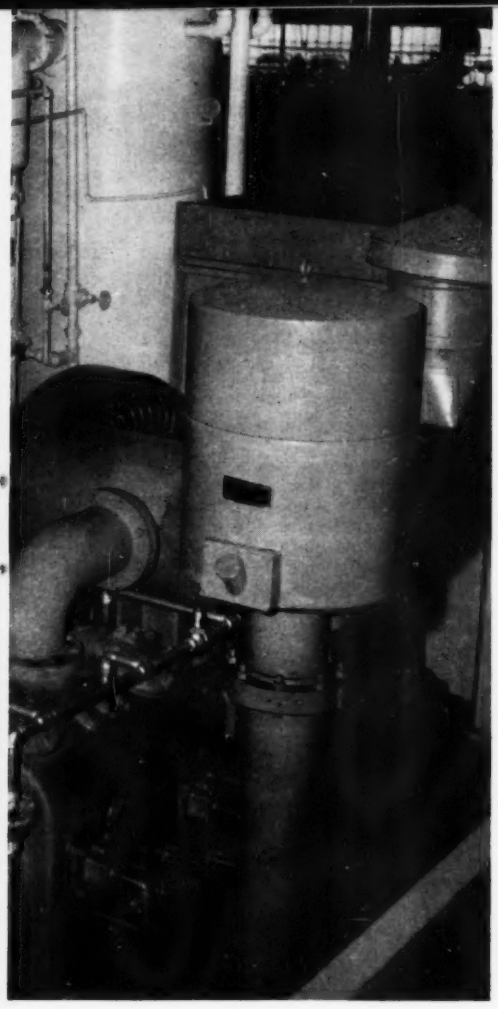
Fig. 1. One of the company-designed test carts which are used throughout plant to check and test all air-operated tools and air lines



BENEFITS of $20,000 a month can accrue from a new compressed air program launched at Ryan. Developed from an extensive survey, the new program outlines the method for obtaining maximum efficiency from air-operated tools, with minimum maintenance. Tests show that these substantial savings may be realized from increased production and reduced operating costs.

Because it is a silent, unseen source of power, compressed air is too often taken for granted. Yet it is a potent production force which deserves expert analysis. For instance, at Ryan 680 hp is required to obtain the compressed air used by air-powered tools. These include 4,000 hand-operated drilling, riveting and grinding tools as well as Ryan's 95 resistance welding machines, huge Cecostamp air hammers and pressure test stations.

Economically, too, the use of compressed air at Ryan involves substantial amounts. More than $2,000,000 a year in wages is paid to just those employees using air-operated tools. In addition, an amount of $82,600 yearly is expended for parts and labor required to keep Ryan's $300,000 worth of air hand tools in good operating condition.



Due to this growing importance, it was deemed advisable to undertake a detailed analysis of compressed air operations. Started several months ago, by the methods engineering department, this study has been completed and the recommendations made are now being carried out.

Under the direction of methods engineering department, this survey disclosed some interesting things with respect to the tools, distribution lines and sources employed in the compressed air activity.

Table I. Line pressure as it is affected by old and new valves and washers

Line Press. PSI	Per Cent Efficiency		Efficiency Increase Per Cent
	With Old Valve and Washer	With New Valve and Washer	
95	48	100	108
98	80	100	25
95	6	90	1400
100	27	88	225
102	5	100	1900
80*	25	56	124
85*	41	56	36

Table II. Examples of gains in efficiency by changing from ¼ in. hose to ⅜ in.

Line psi	Tool Efficiency ¼ in. I.D.	Length	Tool Efficiency ⅜ in. I.D.	Length	Per cent increase
106	76%	12'	100%	12'	31.5%
94	33%	20'	92%	12'	178.7%
94	49%	14'	92%	12'	87.7%
98	46%	14'	90%	12'	95.6%
94	67%	8'	92%	12'	37.3%
100	36%	15'	100%	12'	177.7%

The pneumatic hand tool is a precision instrument which has a long life if properly cared for. In most tools, such as drills and grinders, the only parts which should wear under proper use are the rotor blades. However, it is mandatory that the tools be regularly lubricated. When lubrication ceases, tool damage begins. One damaged or worn part soon affects others and expensive gears and bearings become involved. The cost of rehabilitating a tool which has broken down because of defective lubrication may well run between $50 and $75.

It was shown by the survey that expensive tool repairs could be avoided in almost every instance if a system were adopted which insured the regular lubrication and testing of each tool. Testing is important because frequently a tool will become faulty but its defection will not be apparent to the user. Consequently, he will continue to use it, causing further wear or damage and resulting in loss of production time because the tool is not putting out at its rated capacity.

In order to accomplish the lubrication and testing of tools without discommoding production, an ingenious mobile test cart was devised. Equipped with test instruments and oiling devices, these carts travel through the factory to bring the analytical facilities to the tools in use.

Every Ryan air-operated tool is tested each week. First, the tool is checked on the test cart's tachometer to determine its speed in revolutions per minute. Then, a flow meter check is made to analyze its capacity to handle cubic feet of air per minute. By harnessing the tool to a hydraulic pump which pumps oil against a pressure gauge, a good idea of the power which the tool develops is obtained. Finally, the tool is oiled. If defects show up in the tests, the tool is sent to the repair station for repairs.

In conjunction with the Ryan development laboratory, a special test is being conducted to determine if molybdenum disulphide can be used as a tool lubricant. If this compound stands up as well as preliminary tests indicate, it will be possible to clean and re-lubricate the tools without dissembling them. With the standard greases now used in tool bearings and gears, this cannot be done because the cleaning solvent washes the lubricant away. The tool then has to be taken apart and re-greased. If molybdenum disulphide proves to be entirely satisfactory as a tool lubricant, the tools may be serviced completely at the test cart, without disassembly, because this new lubricant is not dissolved by cleaning solvents.

Distributing Lines: Ryan's plant buildings, covering over 750,000 sq ft of space, are adequately served with compressed air. The desired objective is to see that a full 90 psi is brought to each hand tool. Tool manufacturers have standardized their equipment on this air pressure. They state that a tool will lose power if air pressure drops below 80 psi and that undue wear will ensue if pressure goes above 110 psi. Power loss can materially affect production output. For instance, Ryan found that a typical tool could produce 18 parts at 90 psi but only 14 when air pressure dropped to 70 psi.

Fig. 3. Damage which can occur to a pneumatic tool through lack of lubrication. As lubricant disappeared, small parts and gears began to wear excessively. Rotor splines were badly twisted by the time the air tool's gears failed

Fittings Losses: One of the most revealing aspects of the Ryan survey was the pronounced effect which fittings and hoses had upon tool performance. Ryan uses 3,000 quick-

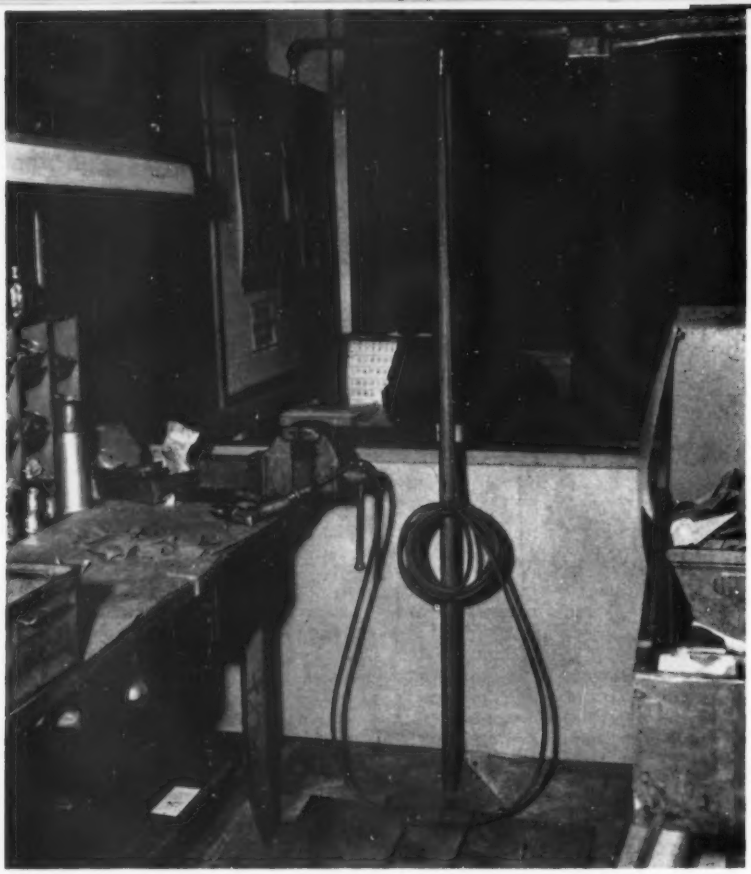
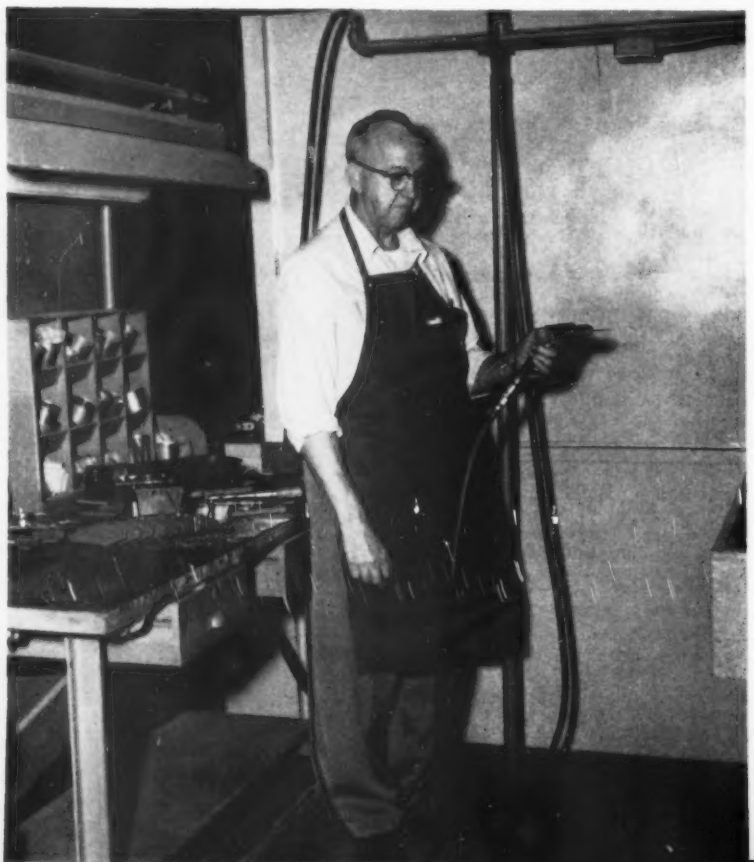


Fig. 4. In this work station, an unnecessarily long air hose had to be coiled to be used. Both hose length and coiling reduced air pressure. In addition, the hose is taken from the bottom of the feed pipe thus making a water trap out of it

Fig. 5. One of Ryan's men, Bruce Tomlinson, now has a more powerful pneumatic drill to use because methods engineers have reduced the length of the air hose serving it. Also, note that air hose is now taken from the top side of the feed pipe



disconnect type fittings. These should be inspected at regular intervals. After months of service, the rubber washers and metal valves in them can become worn and greatly restrict air passage. Their effect on tool operation is shown in Table I on the preceding page.

By specifying the best type of fittings, these losses can be held to a minimum. The pressure drop through a good quick-disconnect fitting and valve is only 3 psi or 5 per cent in tool efficiency.

Causes of Power Loss

Several instances of power loss due to improper size and length of hose used were uncovered by the study. The smallest inside diameter rubber hose recommended by air tool manufacturers is 5/16 in. Often ¼ in. hose sizes are used and no consideration is given to lengths employed.

Tests have proved that as much as 1 psi per foot of hose is lost when diameters are slightly undersize. In some cases it was found that 25 ft of hose were used to serve a work station only 6 ft from the air outlet. A gain of 2 psi was made by merely uncoiling such hose.

A typical situation which can occur is one in which a ¼ in. hose from an air outlet is plugged to a hose of larger diameter which, in turn, is connected to two or more whip hoses for tools. Here, the capacity of every tool is limited by the first undersized hose and further reduced by the lengths and multiple fittings used. In such a case, tool efficiency was increased 42 per cent by merely removing the first hose. Examples of the gains made by substituting ⅜ in. diameter hose for ¼ in. are shown in Table II also on the preceding page.

Basically, Ryan's main compressed air lines were found to be adequate but branch lines were sometimes improperly arranged. For instance, it was found that ¾ in. diameter overhead plug strips were fed by ¼ in. branch lines. In one case a greatly extended branch line was feeding 34 outlets even though another source of air was close at hand.

One common mal-practice was to take the tool outlet from the bottom of the feed pipe, tending to make a water trap out of the outlet.

Standardized Fittings

Ryan uses a good many manifolds, or "pigs" which consist of a short length of 3-in. diameter pipe with a main inlet in one end plate and a drain cock in the other. Six fittings are installed in the barrel to serve tools.

Tests demonstrated that these "pigs" could function efficiently when connected to branch lines through ¾ in. hose and ½ in. pipe fittings. Without

Summary of Survey's Basic Benefits

1—A desirable decrease in the cost of repairs to 4000 air-operated hand tools.

2—A marked increase in the efficiency of these tools resulting in faster, better work, equivalent to increasing the work force.

3—An extension in the life of the $300,000 worth of these tools.

4—A stepped up availability of these pneumatic tools due to better service and reduced periods of out-of-service, equivalent to raising the number of such tools.

5—An increased availability of compressed air power within the plant equivalent to installation of added facilities. This is important because Ryan uses close to present compressor capacity.

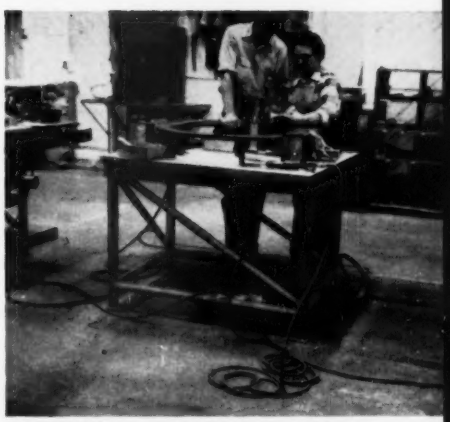


Fig. 6. Other excessively long air hoses may be floor hazards in addition to cutting down tool power because of friction

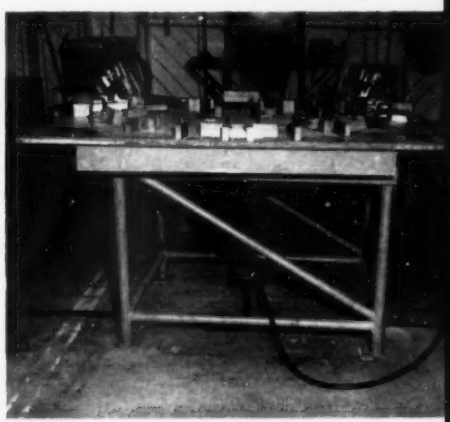


Fig. 7. Here is the correction of a poor situation. Often air lines can be incorporated within the fixture's frames

proper supervision, these units are often converted so that they do not meet these requirements. Sometimes, the drain cocks are removed and a plug or another air fitting is inserted in its place, so that they cannot be drained.

As a direct result of the study, Ryan has standardized on the use of Hansen fittings and ⅜ in. diameter hose lines of the shortest possible run to each work station. All fittings are inspected at regular periods and worn valves and washers replaced.

Also, tapered valves have been replaced with square shoulder valves which permit an average of 14 per cent more air to pass. Care is taken to see that not more than 10 Hansen fittings serve a ½ in. pipe inlet and hook-ups are distributed in as balanced a manner as possible. "Pigs" are served with proper sized hose and fittings and drain cocks were reinstalled.

Increased Production

These steps have increased tool power as much as 200 per cent and have made more compressed air available to the plant. This may sound paradoxical in view of the fact that larger air lines require more air to keep them supplied. As a matter of fact methods engineers estimate that it takes 35 per cent more compressed air to fill the system now because of the enlarged hoses and fittings. However, with full power at each tool, the production jobs are accomplished in a fraction of the time formerly needed with the result that more air power is available to the plant.

Four compressor stations are located in the Ryan plant to provide the necessary compressed air. Five Gardner-Denver compressors and one Worthington are used to develop 3600 cfm at 100 psi. The survey showed that this air entered the main lines of the plant at a temperature of 100 F. As it coursed through the plant and into the hand tools, it cooled and moisture in the air condensed within the system. This water caused rust which flaked off and was blown into the tools. The moist, dirty air entering the tools removed the lubricants and introduced foreign abrasive matter which contributed to excessive maintenance costs.

By improving the design and use of water trapping facilities, Ryan improved this undesirable condition. However, the survey recommended that steps be taken to remove the water from the air before it entered the distributing system. This has been done at one compressor station and is being planned for the others. A Parkhill-Wade air drier has been installed to remove the water content from the air. By means of a triethylene glycol solution, through which the compressed air is flushed, two-and-a-half gallons of water per hour are being removed from the air.

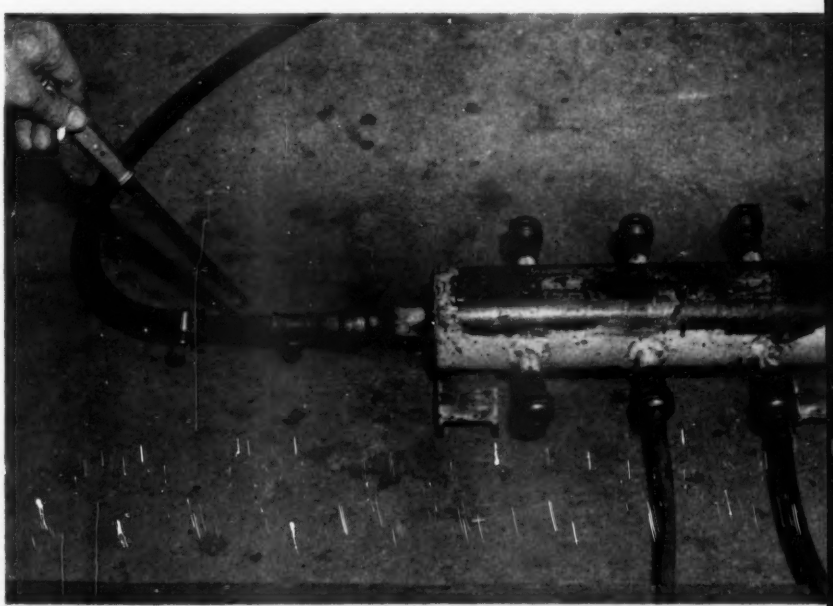


Fig. 8. This situation can occur in any large plant unless systematic checks are made to catch undesirable changes. Here, a ¼ in. air line is employed and, due to its too small size, restricts power supply to six pneumatic tools using this "pig." Drain cock, at right, has been replaced by a plug, preventing drainage

Fig. 1. Welding top and bottom to U-shaped section of cabinet liner is performed by this machine in 15 seconds

Fig. 2. Liners move through infrared oven where ground coat is dried prior to firing in high temperature furnaces

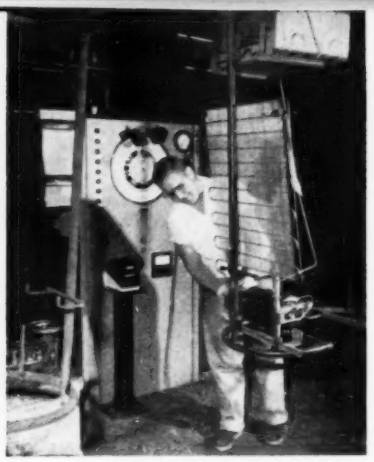


Fig. 3. After making connections, automatic charging board properly apportions refrigerant and oil to units

Hotpoint's Refrigerator Plant Is Engineered for Top Production

In addition to the most advanced equipment, improved materials handling ideas and production techniques have been incorporated in Hotpoint's new refrigerator plant

EVERY IDEA, technique and skill in Hotpoint's new refrigerator plant in Cicero, Illinois, was planned toward one objective: to produce a better refrigerator.

Just a few of the many ideas and techniques that have been incorporated in this plant are mentioned to show how Hotpoint is attaining its objective.

A new method of fabricating condensers is employed at the plant. It eliminates the use of a large number of wire reels in the fabricating area and permits a close tie-in with the main unit assembly line. Condensers are produced at the rate of 150 per hour, using a fabricating unit developed by National Welding Co.

Forming of the evaporator and assembly of the evaporator back into its proper shape is another new operation in the refrigerator industry. Whereas Hotpoint uses one machine for the complete operation, it is common in the industry to use three to four operations as well as several pieces of equipment.

A machine designed by Struther-Wells to specially incorporate a resistance welder is used to form the evaporator. The welder is laid horizontally across the tangent bender. Then, the evaporator back is placed in the machine with the tube and sheet assembly. Two heads move upward bringing the evaporator sides around and curl them across the ends. The welding points move down and weld the ends together. Final result is an evaporator with a back assembled. Total time is 15 seconds.

Welding method used in welding the header assembly to the evaporator and the copper-aluminum connector to the evaporator is another new development. It employs advanced argon welding techniques. No manual welding is used. The entire welding process is completely automatic. The process and welding machine was designed and built by Hotpoint engineers.

An automatic anodizing machine designed by the Meeker Co. is used for anodizing the evaporators. After anodizing, the complete evaporator is inspected for anodizing thickness. A G. E. Type H leak detector is used to detect any minute leaks that may occur in the tubing or welded joints.

The main assembly conveyor line starts in the evaporator department where it picks up the evaporator. It moves to the condenser and

Fig. 4. Overhead conveyor lines carry components and subassemblies to main assembly lines and provide mass overhead storage of various models. Conveyor line has more than 35 separate systems and is approximately 9.8 miles in length

Fig. 5. This Hotpoint designed-patented rack holds at one time the door, cabinet and base panel as they move through prime coating and cleaning operations before final coating in the Ransburg No. 2 electrostatic paint spraying section

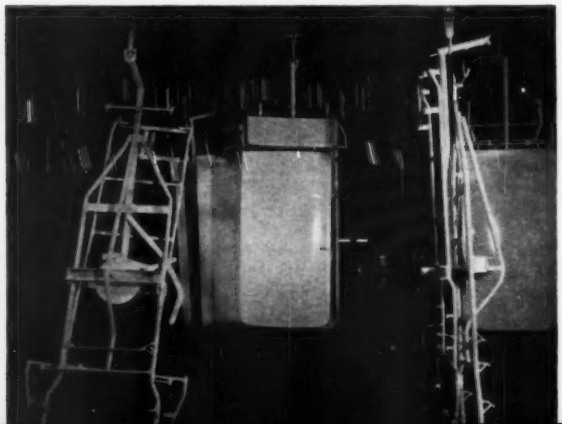


Fig. 6. Removal of improperly operating vacuum cart and replacement with another is performed quickly and easily with movable crane. Vacuum carts hold vacuum on all cooling units going through dehydration ovens to remove moisture

Fig. 7. Here is another special rack which brings the finished cabinet and freezer compartment doors to the main assembly line. After final assembly, the sealing of door and cabinet in general is tested by means of exerting pressure inside cabinet

mounting frame assembly department picking up these assemblies. Then it moves to the tube fabricating department where it picks up the heat exchanger and other tubing. It proceeds to the silver soldering operation where the unit is charged with an inert gas. Before the last joint is silver soldered, dry air is forced through the entire system at a controlled pressure and the air flow measured to determine if the entire unit is functioning properly or if any restrictions exist.

When the last joint is brazed, the cooling unit is charged with high pressure dry air and sent through a washing operation to remove any dirt or materials from the welded joints. The unit is then submerged in a high pressure leak test water tank for a minute and a half to test for any leaks that may be present. As it passes through the tank, operators watch for tiny air bubbles, which if present will rise to top of tank.

The cooling unit now moves to what is probably the most critical process in the plant, dehydration. This process removes all the moisture that is present in the cooling unit. Designed to Hotpoint specifications, by Consolidated Vacuum Co., the dehydration system reduces the moisture to about 50 per cent of that left in the unit by other systems commonly used in the industry.

After the dehydration operation, the cooling unit continues on a conveyor line into a hood where there is a low concentration of helium. If the unit leaks, helium gas is sucked into it, due to the high vacuum from the vacuum carts in dehydration.

Very sensitive mass-spectrometers are used to detect helium in the cooling unit which would indicate a leak.

Passing to the next station, the unit is charged with oil and freon. Use of a special automatic oil and freon charging board developed by Acme Aluminum Alloys Co. injects the correct amount of oil and freon into compressor of cooling unit.

Then the unit moves to an automatic dip tank, is painted, moved upstairs for wire harness attachments and sub-assembly parts, then to the test room. After tests are made, the unit moves on the conveyor to the make-up area prior to moving downstairs to the final refrigerator assembly line.

After the refrigerator is finally assembled, the unit passes through another G. E. Type H leak test and another noise test. To test the sealing of the door and the cabinet in general, Hotpoint uses a very rigid test in which pressure is exerted inside the cabinet. A gage indicates the tightness of the seal.

Another unusual feature found in the new refrigerator plant is the reversible storage conveyor line. This line is used as (1) reserve storage to insure production on the refrigerator assembly line, and (2) permits possible simultaneous scheduling of two models on the assembly line while the fabrication line is running other models.

Fig. 8. Operator checks for proper operating characteristics such as freezing ability and frost lines of cooling units as they take two hours to pass through air conditioned test room, where constant temperature and humidity is maintained

Fig. 9. Refrigerators and range lines converge at this point in storage and loading area. By pushing necesssary buttons, operator can get any combination desired for loading. This system facilitates rapid handling and loading of mixed cars

PAINT SPRAY SHOPS—
Yours, Like This One, Can Yield Good

By RALPH HOPKINS, Assistant Plant Engineer, Crouse-Hinds Company

Fig. 1. Explosion-proof fluorescent lighting fixtures, alongside plenum, light inspection area with 35 footcandles

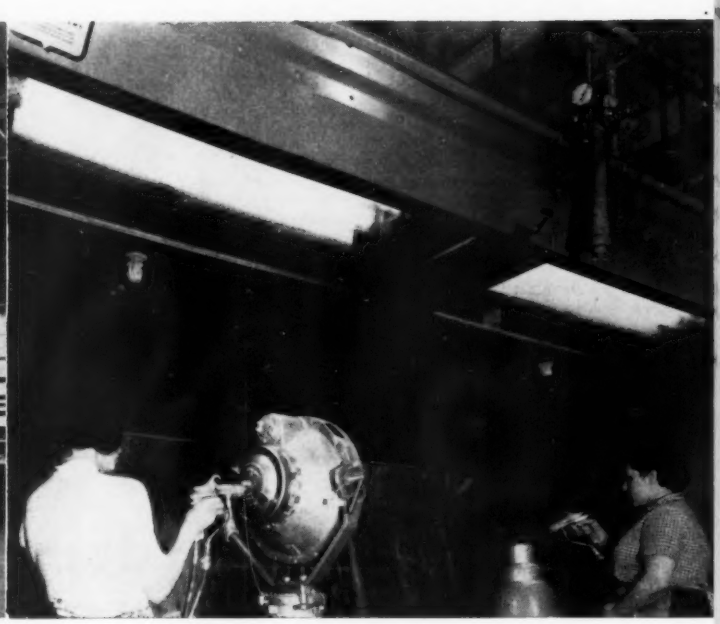


Fig. 2. In water wash spray booth the wire glass windows separating lighting fixtures and paint vapors, permit cleaning

FOR THE PAST few years, a general building program has been underway at Crouse-Hinds Company, Syracuse, N. Y. Part of this expansion in manufacturing facilities called for the improvement of the paint-spray and parts cleaning department. The old department was too small, lacked production capacity and proper equipment. Moreover, its dry type booths caused air pollution and required excessive stack cleaning.

By installing a new department in a new location we were provided with an opportunity to select and engineer suitable equipment and also to plan a streamlined layout that would expedite our production flow.

Completed a year ago, the new enamel and washing department delivers about 30 per cent more production. Moreover, many small wash operations from various parts of the plant have been transferred to the department's new and more efficient equipment for this job.

Located on the second floor, adjacent to departments where most parts to be washed and painted are assembled, the new paint room is 7800 sq ft in size. Parts are shuttled in and out by means of power trucks, using two large electrically-operated doors at each end of the area.

Provision was planned for a safe, well-ventilated paint storage room, conveniently located near the spray booths as well as a well lighted furniture refinishing room and foreman's office.

The first operation, degreasing, is opposite the entrance where fifteen dip tanks are provided. (See flow chart.) Here, the major cleaning solution is hot alkaline but several stainless steel tanks contain phosphoric acid solution for cleaning and etching aluminum parts, and removing scale, flux and rust from iron and steel parts. About half of the cleaned pieces go back to assembly or to stock while the remainder are accumulated in the central area of the department to be painted.

Besides offering operators maximum convenience at their work, these tanks have several installation features that insure a high quality cleaning job, easy control and convenient maintenance.

First, the tanks are placed in a pit, so that an operator stands at a convenient work level. All supply and drain valves, as well as the air hoist control, are operable from the front of the tank.

Next, steam plate coils rather than pipe coils were used to concentrate ample Btu's at the front end of each tank. This creates a rolling boil, so that the solutions circulate upward over the coil, across the top of the tank and back to the scum trough at the tank's rear edge. Thus, a constant surface cleaning action of the solutions takes place. To facilitate removal for cleaning, plate coils are installed with union connections, accessible at the front of the tanks.

Cleaned parts that are to be painted are routed from the central

Production Dividends

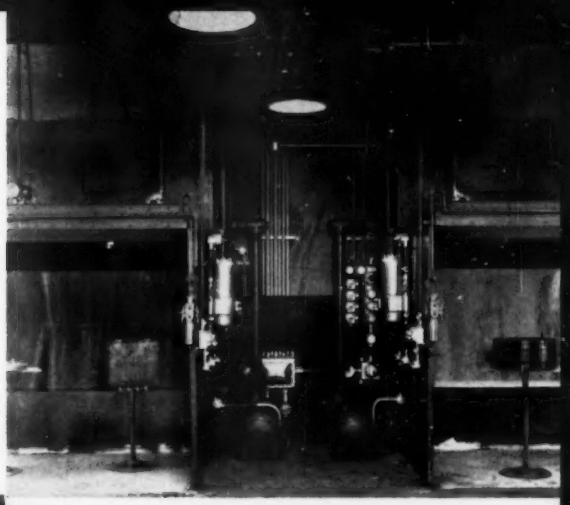


Fig. 4. Explosion-proof motor starters, circuit breakers, switches, junction Condulets, energize and protect pumps for water spray

Fig. 3. Degreasing tanks have been placed in a sub-floor pit to aid air-hoist handling. Union connection of coils permits removal for cleaning

Paint shop spray booth areas are classified by the National Electrical Code as hazardous areas . . . Here's how Crouse-Hinds, manufacturers of explosion-proof electrical equipment, laid out and equipped its own paint spray finish department

storage area to any one of the seven DeVilbiss water wash spray booths. Each booth's ventilating fan exhausts 12,000 cfm, drawing overspray away from booth operators.

Seven-hundred fifty gallons of chemically treated water is pumped each minute through each water curtain, removing all paint solids. As a result, stack maintenance is now unnecessary. Sludge is partially removed from the spray booth tanks daily and each tank is drained and cleaned weekly.

The batch type gas fueled paint baking oven, manufactured by the Michigan Oven Company, bakes racked parts at 350 F for 30 minutes. Its two individually controlled compartments each hold three trucks. As one truck load is removed from the rear each half hour another unbaked load is pushed through the entrance door.

Besides the heat circulating fan in each compartment there is an exhaust fan which for safety reasons removes flammable solvent vapors. This exhaust also serves as a safety purge in the oven lighting cycle. Complete safety devices are provided for automatic gas shut-off in case of failure of the pilot or fans.

In order to supply adequate make-up air to replace that exhausted by the oven, spray booths, and tank exhaust systems, and to maintain a positive air pressure in the painting area, our plant engineering staff, in collaboration with DeVilbiss Company engineers, placed four air replacement units on the roof of the department.

Pneumatic Control

Thus placed and without requiring space in the production room, they successfully supply about 90,000 cu ft of filtered, tempered air per minute to the department. Regardless of cold weather, proper temperature of the incoming air is insured by a Johnson pneumatic control system. Primary filters of the units, for economical maintenance, are washable.

By using four separate air supply units it is possible to balance the air intake and exhaust when some of the spray booths are not in operation. Maintenance of individual units also is permitted without a complete shut-down of the air supply system.

All make-up air is forced downward into a large plenum 48 ft by 8 ft by 4 ft located next to the ceiling above the inspection area. From this plenum air is delivered through a large area of disposable secondary filters along the ceiling. Because a large volume of air enters the room at a relatively slow speed, air replacement takes place comfortably.

The National Electrical Code generally defines hazardous finishing areas to be: the interior of spray booths and their exhaust ducts; all space within 20 ft horizontally in any direction from spraying operations more extensive than touch-up spraying and not conducted within spray booths; all space within 20 ft horizontally in any direction from a spray booth's open side or from dip tanks or their drainboards; and all other spaces where hazardous concentrations of flammable vapors are likely to occur.

Consequently, Crouse-Hinds explosion-proof lighting and other electrical equipment is used extensively throughout the new enamel and cleaning department.

Lighting, for example, was engineered to provide adequate illumination of spray booth interiors,

Fig. 5. Water-wash spray booths in enamel and cleaning department at Crouse-Hinds. Explosion-proof fixtures are used for general lighting; explosion-proof fluorescent lighting fixtures are installed for illuminating spray booth interiors

storage, inspection, and cooling areas. Seventeen 300-watt explosion-proof incandescent fixtures deliver 35 footcandles of light over the dip tank section and 22 of the same type EVA fixtures illuminate the general work area with 25 footcandles of light.

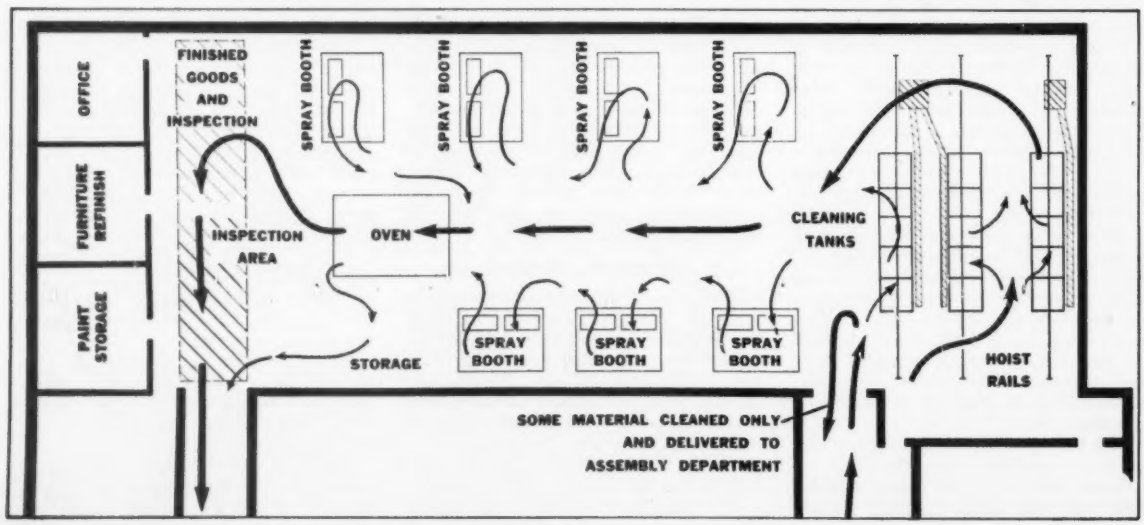
The inspection area, interiors of water spray booths and the furniture refinishing room are equipped with explosion-proof fluorescent fixtures that provide 35 to 40 footcandles. In the paint storage room—also defined as a hazardous location—four explosion-proof incandescent fixtures provide 35 footcandles.

In addition, wherever the National Electrical Code prescribed, a variety of explosion-proof Condulets were installed in the new paint shop. Explosion-proof motor starters and circuit breakers, tumbler switches, junction Condulets, push-button stations and sealing Condulets were used to shield flammable paint solvents in the air from electrical arcs or sparks.

In spite of the fact that the flow of materials has become more and more complex, the new Crouse-Hinds enamel department continues to outstrip the production capacity of the old shop. For instance, "cocooning" flexible explosion-proof connectors and lighting fixture supports with an anti-corrosion envelope consumes a weekly quantity of 70 gallons of vinyl. Or the fact that our present facilities now apply 28 different production colors to a multiplicity of casting shapes and sizes that range from a fraction of an ounce up to 60 pounds.

But new production records aren't the new department's only achievements. Because its engineering features are so much better, it offers better working conditions, more convenience and safety, giving employee morale and higher efficiency.

Fig. 6. Diagram of paint spray department at Crouse-Hinds shows good material handling planning and logical work flow



Applying New Frame Size Motors to Existing Installations

Blocking-up for proper shaft centering, and re-drilling of base are only two problems, says the author

By C. V. IRISH, Chief of Electrical Design, Electro Dynamic Division, General Dynamics Corporation

AS IN ALL INDUSTRY during the past twenty years, there has been great advancement in the art of electric motor design. However, motor sizes have not changed due to the standardized dimensions which were established for the benefit of industry as a whole. Because of the progress in the art of design, and the need of conserving critical materials, it was imperative that a re-rate program would take place.

The trend in industry over the years has been to smaller, more compact, equipment. This is being accomplished in the motor industry by the one re-rate program, thereby causing the minimum disturbance to the users of electric motors. The machinery manufacturers can easily adapt the new, smaller motors to their equipment by a change in their base. The question arises, however, as to what the plant engineer will do when he has to apply a new or replacement motor to an old machine.

As the new motor is always smaller, there is no question of space to accommodate it. It will always have to be blocked up to bring the centerline of the shaft in line with the drive. The size of these blocks is easily determined from the frame numbers of the old and the new motors, as the first two digits of the frame number divided by four equals the dimension from the motor base to the shaft center.

Simple Calculation

For example: a 180 diameter motor has a shaft center height from the motor base equal to 18 divided by four, or 4½ in. The diameter of the shaft extension may be different from the old motor requiring a change in the bore of the coupling or sheave. The old base will have to be re-drilled to match the mounting holes of the new motor.

Trend in industry is always to step up production from a given machine and this usually requires a change to a motor of a higher horsepower output than previously required. In the past, a larger horsepower motor was often on a larger diameter and therefore required a major change in the machine drive to obtain the necessary space for the larger motor.

With a re-rate motor replacing an old motor, the next larger horsepower motor is always still on a smaller diameter frame than the old motor and therefore can be installed with no more trouble than replacing a motor of the same horsepower. In fact, the second larger horsepower motor in the re-rate frame is, in most cases, still on a smaller diameter frame than the old motor that is to be replaced. This means that, in most cases, it will be possible to install a motor of double the horsepower output with no more trouble than replacing a re-rate motor of the same horsepower output.

As the plant engineer first thinks of re-rate motors and using them to replace old motors, it will seem like a very messy job. However, if he considers the troubles of replacing an old motor with a higher horsepower motor before re-rate, against the comparative ease of doing this job with a re-rate motor, he will agree that even this particular dark cloud also has a silver lining.

Will a considerable amount of time and money be expended in re-motorizing machine tools with new NEMA frame sizes?

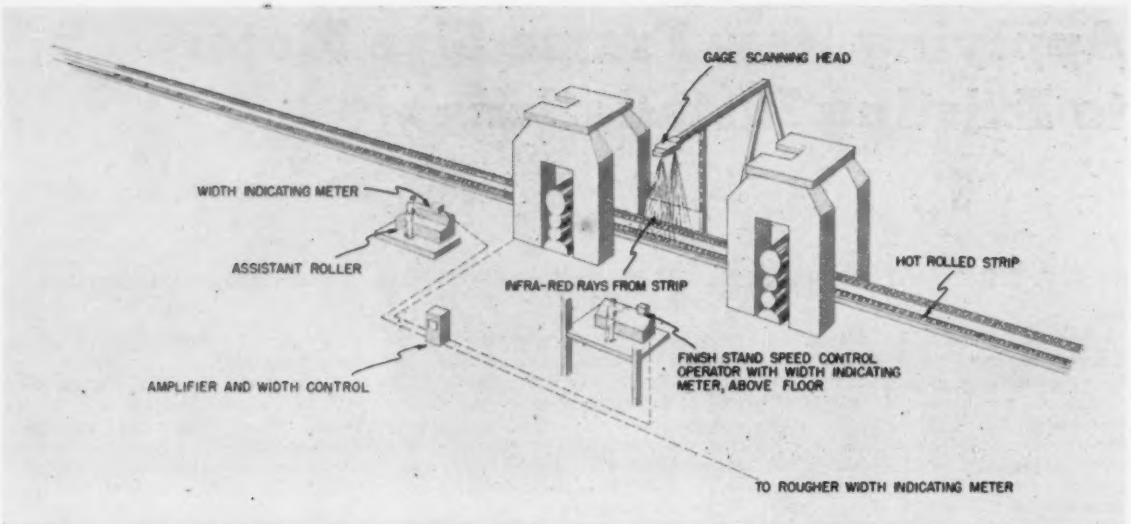

GAGE SCANNING HEAD
WIDTH INDICATING METER
ASSISTANT ROLLER
INFRA-RED RAYS FROM STRIP
HOT ROLLED STRIP
FINISH STAND SPEED CONTROL OPERATOR WITH WIDTH INDICATING METER, ABOVE FLOOR
AMPLIFIER AND WIDTH CONTROL
TO ROUGHER WIDTH INDICATING METER

Fig. 1. Sketch shows installation of electronic width gage on hot strip mill of Gary Sheet and Tin Mill, of United States Steel Corp. Gage scientifically measures and records width of steel strip; burn marks on pine board verify width

Pine Boards Verify Gage Accuracy

PINE BOARDS are being used to verify the accuracy of an ingenious electronic width gage at U. S. Steel's Gary Sheet and Tin Mill, Gary, Indiana.

This simple measuring device is the brainchild of Rolland E. Peterson, department superintendent of the 80-inch hot strip mill, and his assistant, Charles Sanford. It is nothing more than a 4-in. wide, 8-ft long pine board that provides the only accurate check of the new width gage recently installed on their mill.

The gage, the mill's latest innovation, scientifically measures and records the width of the racing, fiery-red steel strip by means of infra-red rays, an intricate arrangement of prisms, rotating mirrors, and related electronic equipment.

But, just to check this electronic device, a crew member places the pine board under the hot ribbon of steel. The hot steel, operating at speeds in excess of 1,500 fpm, burns its exact width into the board. The burn marks are then measured and checked against the electronic instrument located on the finisher's pulpit.

The gage and pine board enable the mill to produce and control the width of coiled steel products more accurately than in the past.

Fig. 2. For electronic accuracy, men check gage which records width of steel strip as it emerges from finishing stand

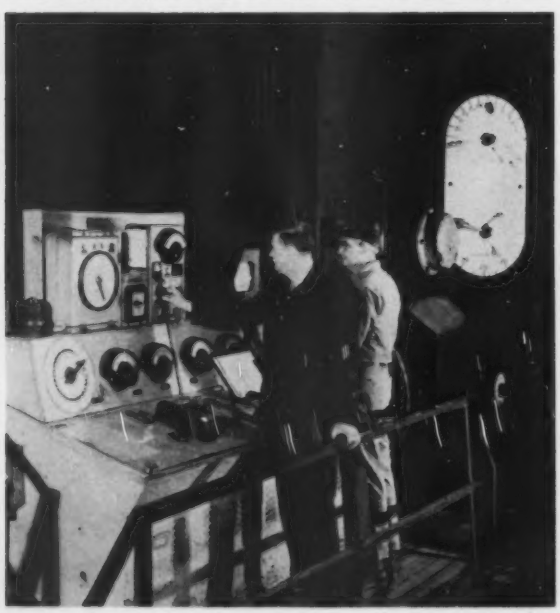


Fig. 3. Burn marks on board indicate exact width of steel strip. These marks are checked against the electronic device

Instituting Preventive Maintenance Systems Requires Good Spadework

By BYRON A. ENGELBACH, Consulting Engineer

PREVENTIVE MAINTENANCE is not new. The terminology may be, but the methods are old. Evolution has caused the practice to advance, progress and expand.

As the scope of work of those responsible for maintenance of industrial equipment broadened, and their responsibilities and duties became more extensive and complex, maintenance became an organized function and operations were controlled and governed by standard procedures.

Maintenance of a preventive nature originally was incorporated in the job only by implication and in many instances so vaguely as to be barely recognizable. Much was, and still is, left to the discretion of the person in charge of maintenance. His ability to interpret the operation's procedures or his desires to assume responsibilities determines the extent and coverage of preventive maintenance practiced under his supervision.

Control System Needed

Anticipation of mechanical failure and the institution of corrective measures prior to actual breakdown resulting in production losses has become increasingly important. No longer should management depend on uncontrolled and implied preventive maintenance. Capable and competent personnel should be commissioned to investigate the problem and to finally set up a control system and procedure which will insure meeting the specific needs of the case in question.

When the subject is given a reasonable amount of thought and consideration, it is only too obvious that there is no single procedure which will fit all cases or even an appreciable and sizable group of related cases, such as an entire industry. Variables which are present in the manufacture of a product make this impossible.

Actually, the control system and the procedure should be so designed as to tie in with the standards of operation already in use wherever possible. There are a great many instances where there would be no alteration in present operation standards other than the additions necessary for the actual operation and control of preventive maintenance. In other instances, and these are undoubtedly in the majority, especially in smaller plants, considerable change in office procedure, pertaining to accounting and capital asset accounting and records, must be made before the new preventive maintenance program can become a part of the general operation standards.

Many industrial units have preventive maintenance programs in operation and under some degree of control, without being aware of the fact. These examples are not included in the standards of operation for the plant but have been set up by foremen or department heads who want to run their departments at maximum efficiency.

Such a condition might apply to only one piece of equipment in a department or to a group of related machines. The acquisition of a new continuous process unit replacing an older method, may have been the basic reason for a better maintenance job being done, partially on direct advice from the manufacturer of the equipment and partially due to "learning the hard way" that the unit will not operate anywhere near the predetermined output without the entire unit being brought under a preventive maintenance program.

State and local safety codes and insurance companies' demands are also responsible for instances of preventive maintenance.

Take the case of the manufacturer whose process requires that steam be available at all times, 24 hours per day, 365 days per year. His power plant is equipped with 5 Manning-type, fire tube, upright boilers. The demand steam load never exceeds the allowed maximum output of 3 boilers. The chief operating engineer, by experience, has fixed the standard operation at below maximum output and 4 units are used to carry the load since efficiency is highest and the maintenance cost lowest when the plant is operated on this schedule.

One unit is taken off the line for a two-week period for general cleaning, inspection and necessary repairs. At the end of the two weeks, it is fired and put on the line and another boiler is given the same processing. This results in a maintenance cycle of 10 weeks for each boiler and is controlled by the chief operating engineer. The boiler house log sheets are the controlling system and accurate records of everything done on a specific unit is conscientiously maintained. After cleaning, the state and insurance inspectors go over the unit thoroughly and recommend any needed repairs.

The chief operating engineer then prepares an additional list of repairs which he feels are necessary beyond those required by law or to meet insurance standards. After the work is completed, another inspection and test is made by the inspector and the boiler is ready to be put on the line and is held as a standby unit until the end of the two-week shutdown period. This is a good example of preventive maintenance practice

1. **Many plants have partial preventive maintenance systems in operation without being aware of it.**
2. **Outside influences such as safety codes and insurance companies are responsible for instituting many PM systems.**
3. **Boilers, process air conditioning and refrigeration and elevators are subject to PM systems in nearly every plant.**
4. **A good PM system keeps management aware of poor equipment design, information on proper production scheduling, and a complete capital assets record for use in reordering units and for stocking of replacement parts.**
5. **But, above all, every interested person must be sold on preventive maintenance or the system may fail.**

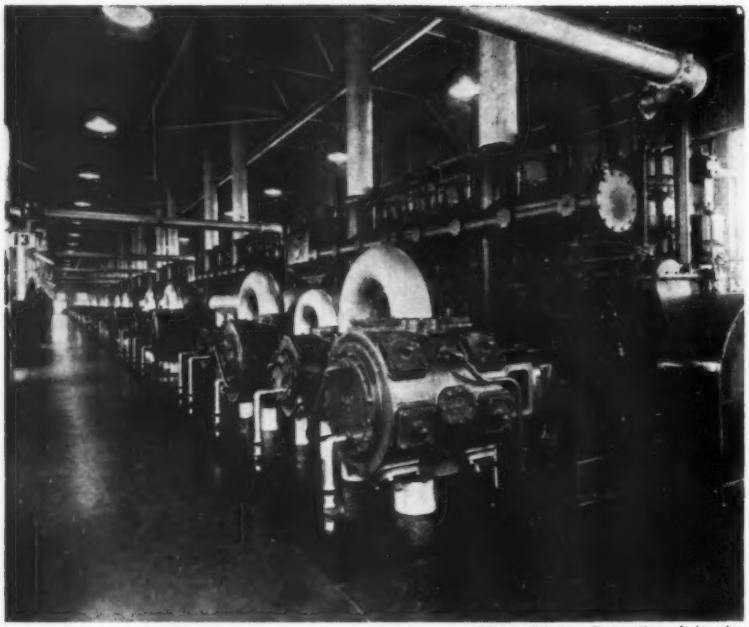


Photo: Celanese Corporation of America

Fig. 1. When air compressors are a vital part of a plant's production equipment there is generally instituted a PM system to insure their continued operation

which has been implied in the maintenance standard procedure and which is also influenced by safety codes and insurance requirements.

Another example where outside influence forces on management the practice of preventive maintenance for specified equipment is in the case of periodic elevator inspection conducted by local authorities. Here, maintenance work is instituted by these inspections before actual mechanical failure of equipment occurs.

Insurance Requirements

There is also the preventive maintenance resulting from inspection by fire insurance underwriter's representatives. This applies to not only the sprinkler system and fire alarm system, but carries over into equipment and buildings in critical zones. It also covers every condition which might be hazardous with respect to fire and explosion. Faults, irregular conditions or practices, etc., are brought to the attention of the company in question and generally a correction is made within a reasonable time.

Certain equipment is also subject to preventive maintenance practice due to influence of insurance underwriters through use and occupancy policies. They require periodic inspection of all equipment covered by the policies they have written and specify that necessary repairs and alterations be made at once on equipment such as transformers, electrical switch-gear, generators, converters, pressure vessels, rotary units, etc., when inspections show non-compliance with certain fixed standards.

Most moderately sized businesses, if asked whether or not preventive maintenance was practiced in their organization would reply that the business could not afford such a luxury. Actually, it would be difficult to find a business that did not practice this form of maintenance. The scope of coverage and method of control would vary, but it would be there.

For example, consider a manufacturer who depends on an air conditioning system for continued summer operation. He also depends on this same unit for insurance against product spoilage. The heart of the system is a steam turbine-driven centrifugal compressor used to chill water which in turn is used in zone conditioning units. A shutdown of this unit for only a few minutes results in production shut downs and heavy loss in certain zones.

If the unit shuts down for over twelve hours, product spoilage running into thousands of dollars could result. The system does not operate for approximately 4 months during the winter season.

It is standard practice, implied and not included specifically in standards of operation and standard maintenance procedure, that the entire system be cleaned and repaired as necessary to insure continued operation without mechanical failure during the coming operation cycle. Representatives of the turbine and the compressor manufacturers are called in to make the inspections and supervise the work. Insurance inspectors are also present after the machines are disassembled to make their periodic inspection.

Critical equipment such as the turbine, compressor, heat exchangers, pumps and controls are completely disassembled and inspected and thoroughly conditioned to as near mechanical perfection as possible. All parts showing wear approaching the critical stages are replaced.

A proper preventive maintenance program can accomplish savings in actual maintenance cost reduction, and also in raw materials, partially processed materials, fully processed stock, and by elimination of man power and equipment waste.

Savings are made in actual maintenance work because critically worn parts are replaced before adjacent parts are damaged to a point where they also require replacement. Not only is there a saving made in part replacement costs but there is the labor saving made in not having to do extra and unnecessary work.

A good example of this would be in the wear of a sleeve bearing on a pump shaft. Permitted to run until the bearing reached the stage where the pump must be shut down because of a frozen bearing or excessive vibration, it would invariably be found that not only was the sleeve bearing worn out, but that the shaft itself had been scored to a point where it was no longer usable and must be replaced. The sleeve is easily replaced, but the shaft replacement entails not only the cost of a new shaft or the rebuilding of the old shaft, but also the additional cost of man hours of repair work.

Another instance is in the wearing of a motor bearing. This allows the rotary section to approach the field coils and if the critical state is reached, it is quite likely the motor will require a rewind job. Controlled inspection will prevent such additional maintenance costs.

Preventive maintenance on boilers points out critical conditions and thus corrective measures can be taken before the part fails resulting in damage to other parts of the boiler or even loss of life. Cracked stay-bolts, replaced after having been located by an inspection before other adjacent bolts fail is a good example. There are instances on record of serious and costly damage indirectly caused by the failure of stay-bolts which resulted in a ruptured boiler place.

Savings on Raw Materials

Further savings are possible with a preventive maintenance program through reduction of losses in raw materials, partially processed, and fully processed stock. Mechanical failure which could have been prevented by periodic inspection, especially in a continuous process unit, is expensive in material losses.

This occurs when partially processed stock cannot be run out of the machine or system. By the same token, finished stock losses could run into thousands of dollars as would be the case in the example cited pre-

viously where the manufacturer depends on an air conditioning system.

Manpower and equipment waste can run on the heavy side, if, due to improper maintenance, additional standby equipment is needed to insure continued production.

Records of inspection and maintenance work, maintained in concise detail, provide a source of information which can be used when new equipment is purchased. These records will influence standardization of purchased equipment, will bring to light weaknesses which have been built into a machine, and point the way for correction when the time arrives for other purchases of similar equipment.

Many dollars are thrown away on maintenance work because information is not readily available which would indicate that the useful economic life span of a piece of equipment had been reached. In the rush of maintenance work, the fact is overlooked that some pieces of equipment require more attention and repairs than is economically sound. A proper preventive maintenance procedure will, through the medium of maintenance records kept on each individual capital asset, point this out.

Sound Procedure

These are only a few of the savings. There is the loss due to production shutdowns when entire departments are without work because of mechanical failure and the employees must receive pay for no work produced. Naturally, preventive maintenance will not put a stop to all mechanical failures during production runs and it will not eliminate all emergency work. It will, if operated correctly and efficiently, hold such occurrences to a minimum.

A sound, workable and efficient preventive maintenance procedure provides management with the following:

(a) A controlled and systematic inspection by trained personnel for the express purpose of exposing or determining needed repairs.

(b) Means and knowledge whereby equipment can be maintained at top operating efficiencies at lowest costs through the reduction of emergency repairs.

(c) Information which can be utilized for scheduling repairs when equipment is out of production or not in use.

(d) Records of all repairs and their cost filed with the individual capital asset record, for use in determining equipment replacement time and specifications, and information for setting up capital assets and maintenance budgets or long range budgets and maintenance projects. Such information is of great value and assistance to the financial division and production division of any company.

(e) A complete capital assets record to balance accounting records. These records will contain complete information beyond that necessary for accounting purposes, which can be used for reordering, ordering spare or replacement parts, etc., and by the industrial engineering division in determining changeability, adaptability, speed ranges, production output, versatility, etc.

It is not easy to set up a system of this sort. Only an engineer well versed in the basic principles and functions of preventive maintenance is qualified to accumulate, interpret, and correlate information which finally becomes a standard procedure. It cannot be too simple, nor can it be so complicated as to be inoperable, nor so involved in unnecessary detail as to be ineffective and thus collapse of its own weight. It must be "tailored" to fit the specific needs, be sufficiently comprehensive as to be clearly understandable, and sufficiently flexible to permit changes.

The ideal procedure, of course, is one which can be installed in piecemeal fashion so that one phase can be put into effect and after it is working smoothly a second phase can be instituted.

It is inconceivable that an entire procedure covering every capital asset, even for a comparatively small industrial unit, will be so perfect as to require no minor alteration or minor change after a proper trial period. The forms and basic procedure should be correct and workable from the start. The sequence and extent of periodic inspections will vary from the original procedure. In many cases the time sequence will be fixed and after a period of operation it will be found that they should be changed.

It should be clearly understood by everyone that this will occur, principally to prevent any later adverse criticisms and to encourage constructive criticisms. The reason for the possible changes lies in the fact that the variables which enter the picture are so numerous as to make it impossible to permanently fix the inspection frequencies or the scope of the inspections.

Overhaul Schedules

If a machine is scheduled for complete overhaul once each year on a basis of 50 forty-hour-weeks and it operates only half that time, it does not necessarily follow that the inspection can be extended for two years. Or if it operates 50 eighty-hour-weeks that the overhaul should be made every six months. Circumstances surrounding this particular case will be the determining factors and might not apply to a twin unit located adjacent to it.

In many instances the inspection schedules and frequency of inspections will be originally compiled from manufacturers' specifications. These, generally speaking, have been set up on an arbitrary basis which the manufacturer feels is the best for his unit. Time alone will prove their suitability.

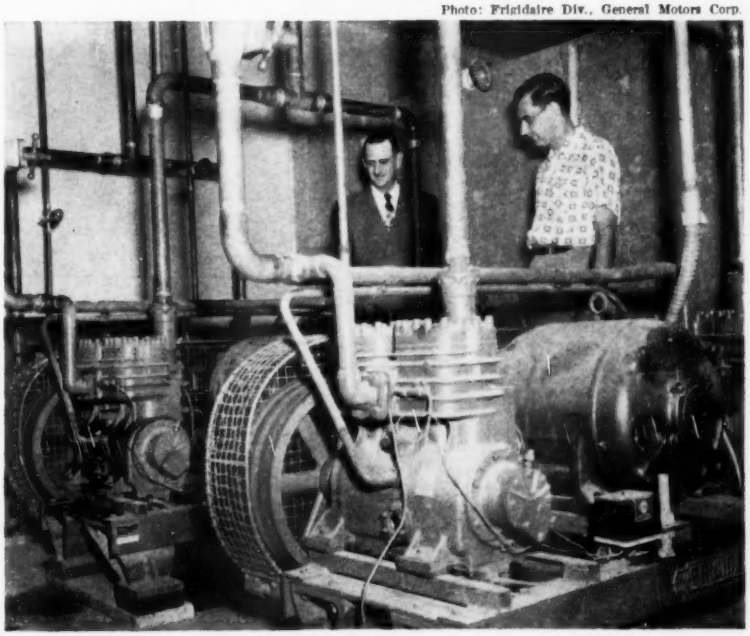
If management has been sold the idea of operating under sound and workable preventive maintenance it is imperative that the entire organization also be sold the idea before the practice becomes effective.

Preferably, this should be done prior to the accumulation of data,

(Continued on page 152)

Fig. 2. Compressors used for refrigeration or air conditioning receive good PM attention particularly if their failure may mean a big loss in plant production

Photo: Frigidaire Div., General Motors Corp.



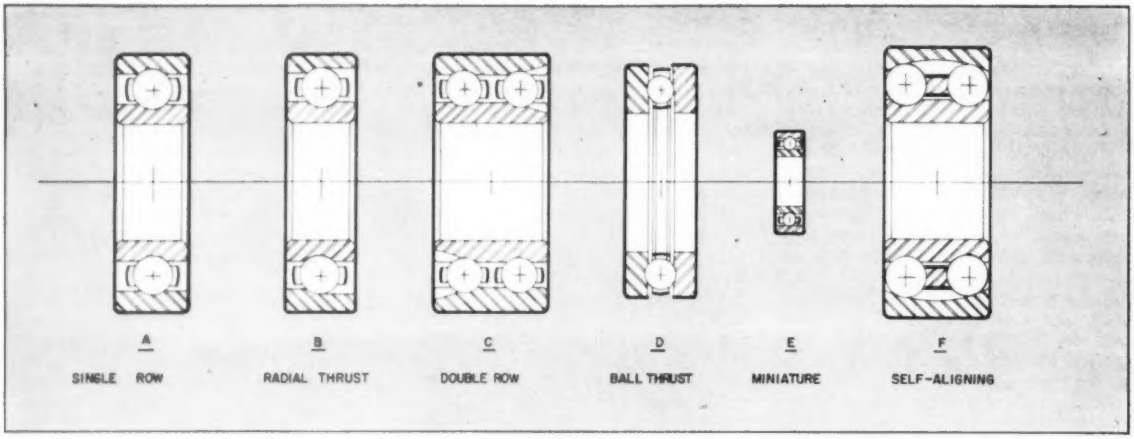


Fig. 1. Sectional drawings of some of the commoner types of precision ball bearings in use today. The text details their uses

WHICH BEARING for Which Service?

Bearings get the way they are because of the service which they are designed to perform . . . The author points out their characteristics, tells how and why to use them, and how to lubricate and seal them

By E. P. STAHL, The Garlock Packing Company, Palmyra, N. Y.

SINCE MUCH OF today's industrial machinery operates on anti-friction bearings, it is important that anyone concerned with the operation of this equipment be adequately informed about the bearings in it and the lubrication and care such bearings require.

Anti-friction bearings are defined as bearings consisting of a series of rolling elements operating between an outer and inner ring or race. Bearings of this type divide into two basic classifications—ball bearings and roller bearings.

In each of these classifications there are a number of different types, each of which has its own structural characteristics and field of usage. The more common types of anti-friction bearings are discussed and illustrated in this article.

Precision Ball Bearings

Sectional drawings of the common types of precision ball bearings in use today are shown in Fig. 1. Design A, Fig. 1, shows a cross section of a single row radial ball bearing. This design is one of the most popular of all ball bearings and is used in many modern machine designs. This bearing will sustain a radial load and a substantial thrust load in either direction, even at very high speeds. This advantage results from close contact between the balls and the grooves or races in the inner and outer rings. In mounting these bearings in a housing, careful alignment between the shaft and the bearing housing is essential. This type of bearing is extensively used in automobiles, tractors, farm machinery, electric motors, conveyor rolls, aircraft accessory drives and many general industrial applications.

Figure 3 shows a typical mounting of two single row radial ball bearings on a countershaft. In this application the bearing at the right hand

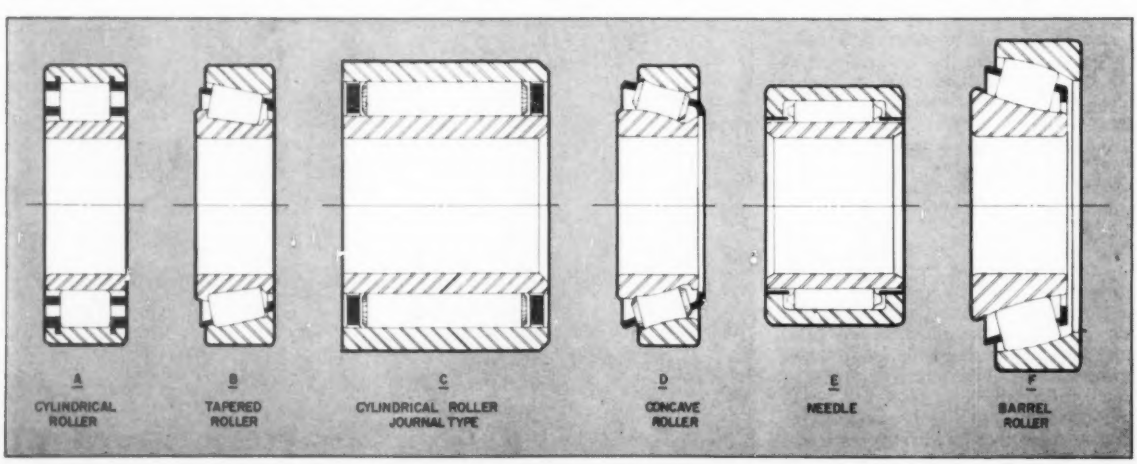


Fig. 2. Roller bearings in common use today are pictured here in cross-section; they are described in detail in text

side has its inner ring held on the shaft by means of a lock nut and its outer ring clamped longitudinally between the housing shoulder and the flanged bearing end cover. This end cover carries a synthetic rubber unit or lip-type seal press fitted into a machined seal recess. The "floating" bearing at the opposite end of the shaft, while tightly pressed on the shaft, is free to float in the housing to allow for expansion and contraction of the shaft and avoid bearing constriction. A bearing end cover equipped with a unit or lip type seal completes the assembly.

Design B, Fig. 1, shows a cross section of a single row radial thrust or angular contact ball bearing. This bearing will support a heavy thrust load in one direction, sometimes combined with a moderate radial load. When the sides of these bearings are flush ground they can be used in duplex assemblies—in tandem for constant thrust in one direction, in pairs, back to back or face to face.

Although the radial thrust ball bearing is not as extensively used as the single row radial ball bearing previously described, it has found wide usage for machine tool spindles, worm drives, pumps, superchargers and centrifugals. Figure 4 shows a typical mounting of a worm shaft using a duplex bearing mounting consisting of two single row radial thrust ball bearings mounted face to face at the left end of the shaft. This dual mounting will carry a thrust load in either direction in addition to a radial load. This type of mounting has been used extensively in worm drives and in pumps where a large reversing thrust load is combined with a radial load at one end of the shaft. The opposite end of the worm in this application shows a single row radial ball bearing mounted in combination with two unit or lip type synthetic rubber seals.

Design C, Fig. 1, shows a sectional drawing of a double row ball bearing of the rigid type. Grooves in these bearings are so positioned that the load lines through the balls have an outwardly converging contact angle. This bearing has a lower axial displacement than the single row annular bearing previously described. It has a substantial thrust capacity in either direction and has a high radial capacity because of the two rows of balls. In general, mounting practices suitable for single row radial ball bearings will also give satisfactory results with double row ball bearings.

Figure 5 illustrates the application of two double row rigid type ball bearings applied to a heavy duty countershaft such as might be found in a gearbox on a steam shovel. In this application the bearing at the right hand side takes thrust in both directions, and because of the pre-

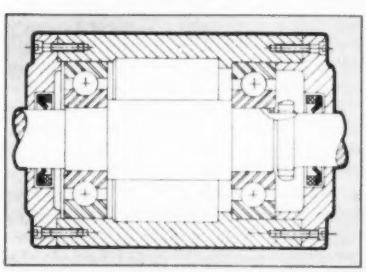


Fig. 3. Single row radial ball bearing

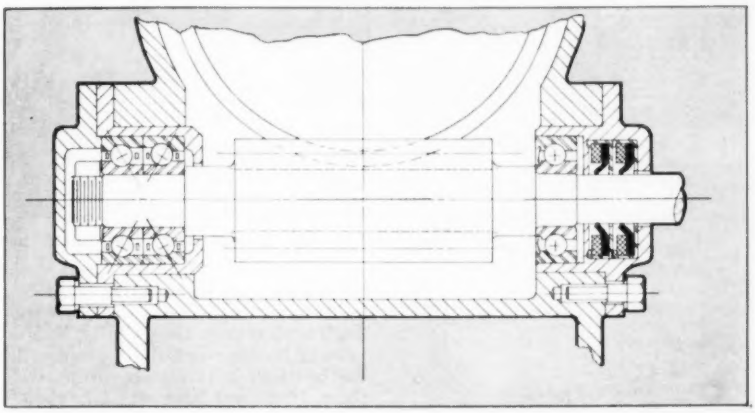


Fig. 4. Worm shaft with single row radial ball bearing and duplex assembly

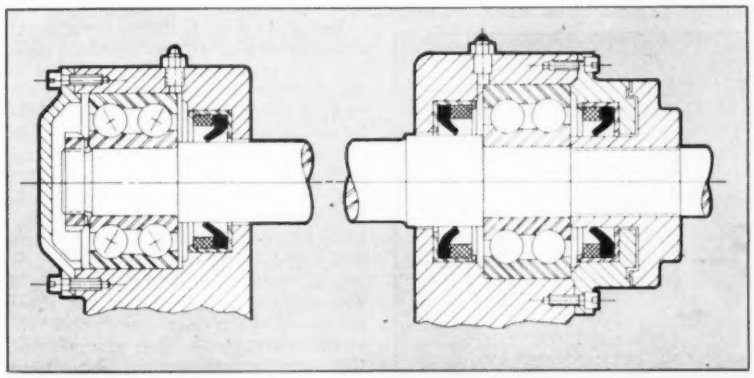


Fig. 5. Typical installation of double row ball bearings for a countershaft

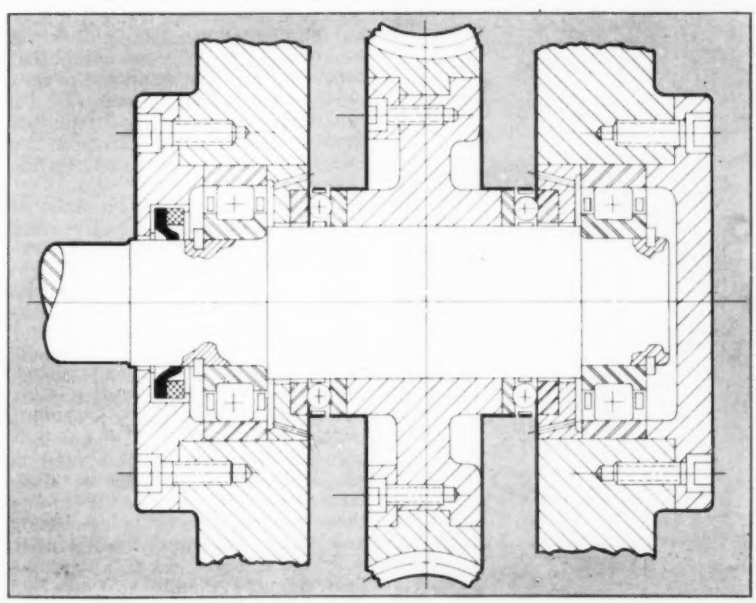


Fig. 6. Narrow cylindrical roller bearings and ball thrust bearings on a shaft

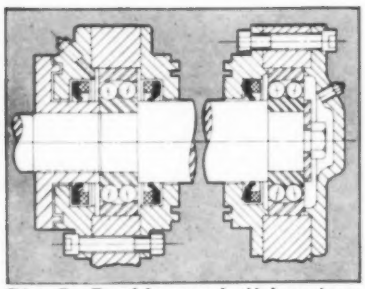


Fig. 7. Double row ball bearings

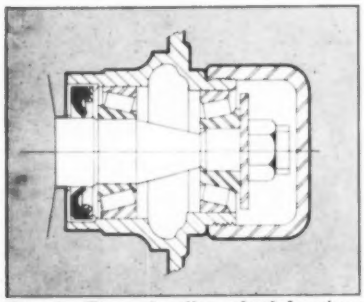


Fig. 9. Tapered roller wheel bearings

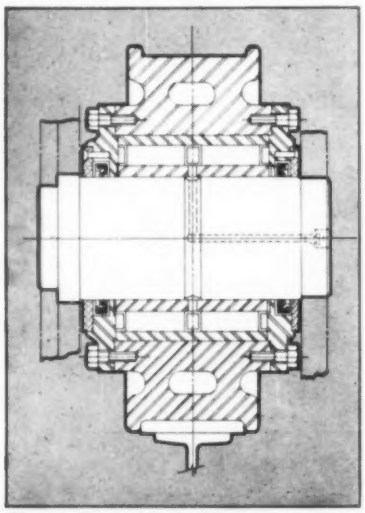


Fig. 10. Journal roller bearings on wheel

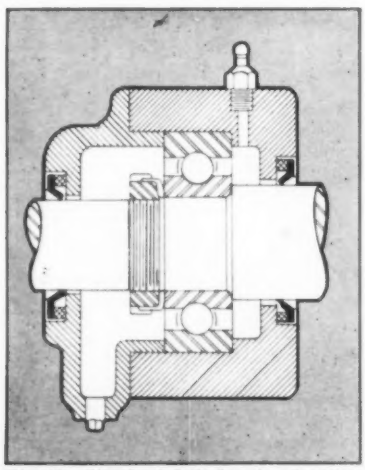


Fig 11. Standard ball bearing housing

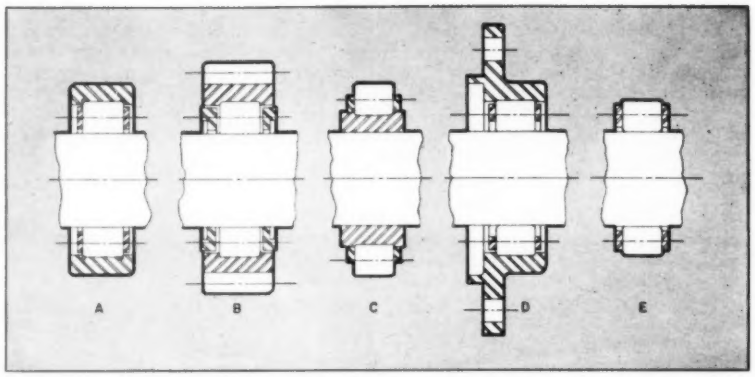


Fig. 8. Typical uses for roller bearing components with races removed

loaded angular contact construction, holds the axial movement of the shaft within very close limits. Three unit or lip type seals are used with the bearings in this design to protect them from dirt and grit. A metal labyrinth seal is also used with the bearing at the right hand side for dirt exclusion.

Design D, Fig. 1, shows a sectional drawing of a single acting plate type ball thrust bearing. This bearing is suitable for thrust loads in one direction only. The load line is parallel to the shaft axis resulting in high thrust capacity and minimum axial deflection. Flat seats on the rings are preferred where the load is heavy or where close axial positioning of the shaft is essential. This bearing should not be used for high speeds under light loads. Figure 6 illustrates a typical worm gear shaft mounting with narrow cylindrical roller bearings mounted in combination with single acting plate type ball thrust bearings in a heavy duty speed reducer. The ball thrust bearings on either side of the worm gear hub absorb the reversing and thrust loads, and the narrow cylindrical roller bearings are employed to carry the radial load. A unit or lip type synthetic rubber seal mounted in a bearing end cover shown at the left side of this design completes the assembly.

Design E, Fig. 1, shows a sectional drawing of a miniature ball bearing such as used in bombsights, instruments, and similar products. It might be well to note at this point that the Norden bombsights used so successfully in B-29 bombers in World War II were originally equipped at some points with sapphire jewels which broke under the high vibratory action. Miniaturization solved this perplexing problem. These miniature ball bearings are mounted in much the same manner as their larger counterparts. In mounting these bearings, accurate machining and perfect alignment are essential.

Design F, Fig. 1, shows a sectional drawing of a double row internal self-aligning ball bearing. This bearing adjusts misalignment resulting in error in mounting or shaft deflection, without loss of load carrying capacity. It does not exert any bending influence on the shaft, an essential for extreme accuracy at high speeds. These self-aligning ball bearings are recommended for radial loads and moderate thrust loads in either direction. Being self-contained they can be mounted in the same way as single row radial ball bearings previously described in this paper.

These double row internal self-aligning ball bearings are suitable for use in small hammer mills, fans, centrifugals, pillow blocks, wood working machines, aircraft controls and pinion shafts. Self-aligning bearings will frequently solve problems as to quiet and durable operation impossible with other types of bearings.

Self-Aligning Bearings

A typical mounting of double row internal self-aligning ball bearings on a countershaft where difficult dirt exclusion problems prevail is shown in Fig. 7. In applications of this kind these bearings are usually mounted in pairs with both inner rings and one outer ring locked and with one outer ring floating as shown at the left-hand side of the drawing. While the housings shown can be machined in one operation, assuring perfect alignment, there are housings or locations where perfect alignment is impossible or too expensive to machine and for which a self-aligning bearing is especially adapted. In the application shown in Fig. 7, metal labyrinth seals for dirt exclusion are used. Their efficiency and reliability are increased by the use of unit or lip-type seals press fitted into bearing end covers.

Figure 2 presents sectional drawings of the common types of precision roller bearings in use in modern machines. Design A, Fig. 2, shows a sectional drawing of a narrow cylindrical roller bearing. This bearing has a high radial capacity and provides accurate grinding of the rollers resulting in a close approach to true rolling. The bearing shown

in Design A, Fig. 2 is made with separable races whereas the others have flanged or shouldered races allowing only a limited free axial movement of the shaft. All have rollers retained in one or the other races when supplied as a complete bearing. All are relatively easy to mount and dismount.

Versatility and applicability of this type of bearing are increased by virtue of the fact that where housings and shafts can be hardened and ground, inner and outer races or both may be omitted, thus greatly condensing the design and simplifying the mounting. Partial bearing assemblies of this kind are shown in Figure 8. Design A, Fig. 8, shows a bearing assembly in which the inner race is omitted, thereby causing the rolls to operate directly on a hardened and ground shaft. Bearing assemblies of this kind are used where larger shaft sections and greater strength are desired without sacrificing load capacity.

Special Features

Design B, Fig. 8, shows a bearing assembly in which a cage or retainer face is used as a positioning element; thus, shoulders on the shaft or in the housing are eliminated. Design C, Fig. 8, shows a partial bearing assembly with the outer race omitted. In this construction the rollers run directly in a hardened and ground housing.

Design D, Fig. 8, shows a partial bearing assembly having a special flanged outer race, thus permitting it to be fastened securely to the housing. This bearing construction is suitable for applications where it is not possible or practicable to extend the housing out sufficiently to provide room for mounting the bearing in the housing proper. Design E, Fig. 8, shows a partial bearing assembly consisting of a cage and rollers only, designed to operate on a hardened and ground shaft and in a hardened and ground housing bore. This unit is suitable for space saving applications.

Continuing with the description of roller bearings, Design B, Fig. 2, shows a sectional drawing of a single row tapered roller bearing. This bearing carries heavy radial loads when opposed to another bearing taking the induced thrust load. It can also carry heavy one-directional thrust or combined loads. It requires adjustment of internal clearance. Steep angle is for predominately thrust loads. Multiple types carry heavy loads in any direction.

These tapered roller bearings are used extensively in automobiles, tractors, mine cars, steel mill equipment, journal boxes, pumps, gear drives and general industrial equipment.

A typical application of tapered roller bearings applied to wheel hub of a pneumatic wheel and sealed with a synthetic rubber unit or lip type seal is shown in Figure 9. In this application the cone assemblies are a slip fit on the spindle and are drawn up against the cups. This design is fairly typical of wheel hubs using tapered roller bearings.

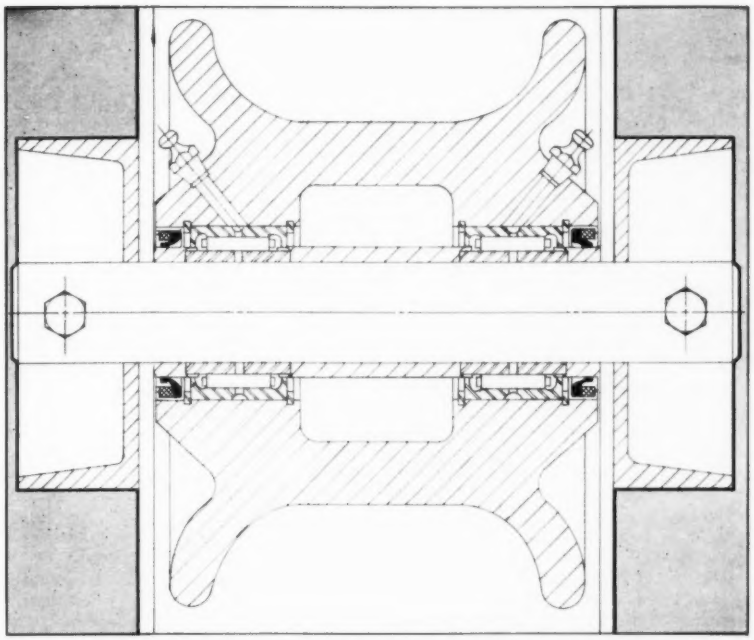


Fig. 12. Drawing shows application of a heavy duty needle bearing to a sheave

Design C, Fig. 2, shows a sectional drawing of a cage or journal type cylindrical roller bearing available with either solid or helically-wound rollers operating between inner and outer raceways. This bearing is the granddaddy of all roller bearings.

The cage or journal type roller bearing is suitable for use in industrial trucks, conveyors, steel mills, cranes, brick cutting machines, turret lathes, ore cars, portable oil rigs, car loaders, metal presses, hoists, automobiles, tractors, wheels for left dams and a variety of other applications.

Figure 10 illustrates the application of cage or journal type roller bearing to the wheel or roller of a lift type dam. In this application lubricant is introduced through the center of the shaft and a hole in the inner race of the bearing. The unit or lip-type seals used in this application are mounted with the lips pointed externally to prevent the entrance of foreign matter into the bearings rather than sealing lubricant in them.

Design D, Fig. 2, shows a sectional drawing of a precision roller bearing with concave rollers. In this radial thrust roller bearing with concave rollers, the inner race is a segment of a true sphere, and consequently is free to move in any direction without altering the contact of the rollers. This provides unrestricted compensation for misalignment and assures normal and efficient bearing operation under all conditions, since the raceway of the bearing provides 3 deg total variation in alignment between the shaft without altering proper roller contact or disturbing the bearing action in any way.

These bearings do not require exact alignment of mounting surfaces. Housing units containing the bearings can often be bolted to unmachined surfaces without fear of trouble from misalignment or shaft deflection.

The bearings are available in both the single and double row types. Single row types are suitable for conveyor rolls, transmissions, gear boxes, aircraft and such. Double row types are suitable for pillow blocks,

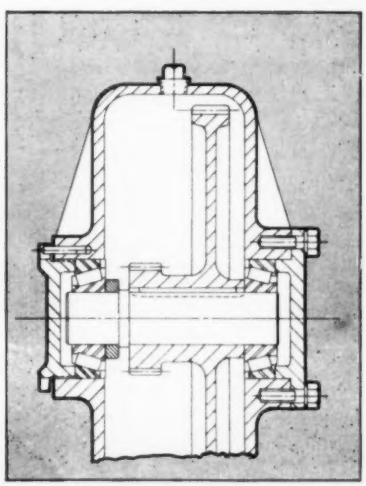


Fig. 13. Tapered roller bearing for use on countershaft of speed reducer

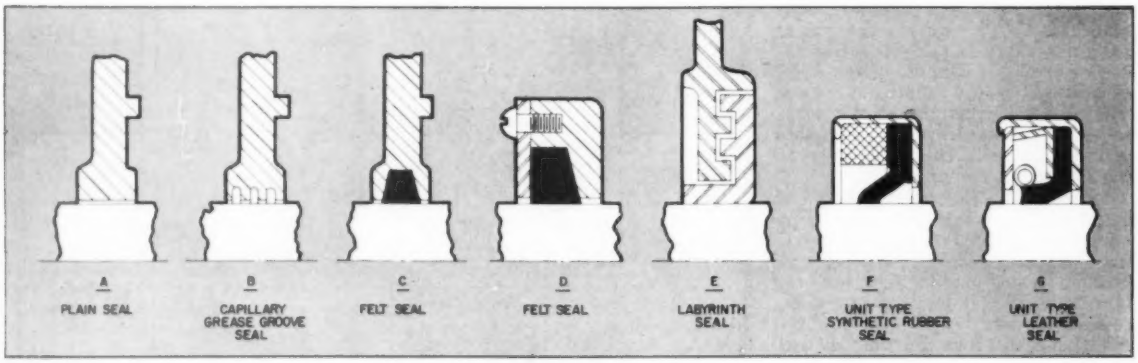


Fig. 14. Illustrations show seven different types of seals commonly used with both ball bearings and roller bearings

line shafts, paper mills, rubber mills, agricultural equipment, fans, blowers, compressors, pumps, hammer mills, oil field equipment and many other general industrial applications where a high capacity bearing is desired.

Design E, Fig. 2, shows a sectional drawing of a heavy duty needle bearing. This bearing is designed to support heavy loads radially without

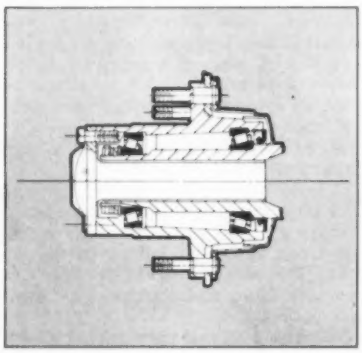


Fig. 15. Rear wheel spherical bearing use

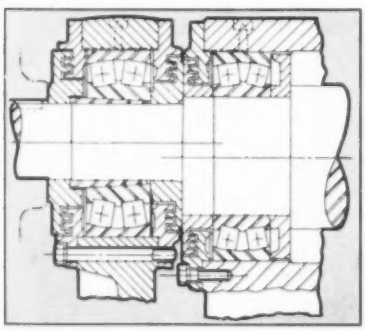


Fig. 16. Spherical bearing for crusher

taking up a large space in this dimension. This bearing operates best when the load is released at least once per revolution.

The needle bearing illustrated in Design E, Fig. 2, is essentially a cage or journal type roller bearing with small diameter rollers closely spaced. This bearing carries heavy radial loads without taking up a large space radially. Since this bearing cannot be flange guided from the inner race, it has rather high friction and operates best when the load is relieved at least once per revolution as stated above.

Figure 12 shows the application of heavy duty needle bearing to a sheave. The bearings are mounted in a straight thru bore and held in place with snap rings. Spacers position the inner bearing races. Unit type seals mounted with the lips pointed outward complete the assembly. Any slight escape of lubricant under the heels of the seals lubricates the seals, also the rubbing surfaces between the ends of the pulley hub and the side frame. This application is fairly typical of needle bearings applied to sheaves and loose pulleys.

Other Roller Bearings

Design F, Fig. 2, shows a sectional drawing of a single row spherical ball bearing with barrel-shaped rollers. This bearing has unexcelled capacity and is inherently self-aligning. It can also carry heavy one-directional thrust or combined radial and thrust loads.

Figure 15 shows barrel type spherical roller bearings applied to the wheel hub of a ¾ floating rear axle on an automobile. The bearings, in this application, are drawn up against their outer races by means of a lock nut on the end of the axle tube. A unit or lip type seal at the inner end of the hub completes the assembly.

These barrel type roller bearings are designed especially for the load conditions found in automobile front and rear wheel service, where heavy radial and thrust loads encountered when turning corners sharply at high speeds may alternate with severe pounding or vibratory loads set up when travelling rough or rutted roads.

Spherical roller bearings are also available in double row or multiple assemblies. Double row spherical roller bearings are suitable for railroad journal boxes, steel mill equipment, paper mills, rubber mills, fans, blowers, compressors, pumps, hammer mills, oil field equipment and many other general industrial applications where a high capacity bearing is desired. Figure 16 shows double row spherical roller bearings applied to a jaw crusher. Labyrinth seals are used for dirt exclusion. Design 3, Fig. 2, shows a sectional drawing of a tapered roller bearing.

The tapered roller bearing though unique in design is remarkably simple. The design of the tapered roller bearing consists fundamentally of tapered rollers operating between tapered raceways.

This bearing carries heavy radial loads when opposed to another bearing taking the induced thrust load. It can also carry heavy one directional thrust or combined load but requires adjustment of internal clearance. Steep angle type is for predominantly thrust loads. Multiple row types carry heavy loads in any direction.

The tapered roller bearing is one of the most versatile and simple of all anti-friction bearings. Essentially it consists in constructing the rollers as well as the raceways on the principle of a cone so that lines drawn coincident with the working surfaces, etc., of the rollers and the races will meet at a common point. These bearings will handle all loads, radial, thrust or both, in any combination. Tapered roller bearings consist of the same number of parts as any other type of anti-friction bearing—an inner raceway or cone, an outer raceway or cup, rolling elements and a cage or roller retainer. A typical application of tapered roller bearings applied to the countershaft of a speed reducer is shown in Fig. 13.

Lubrication of Bearings

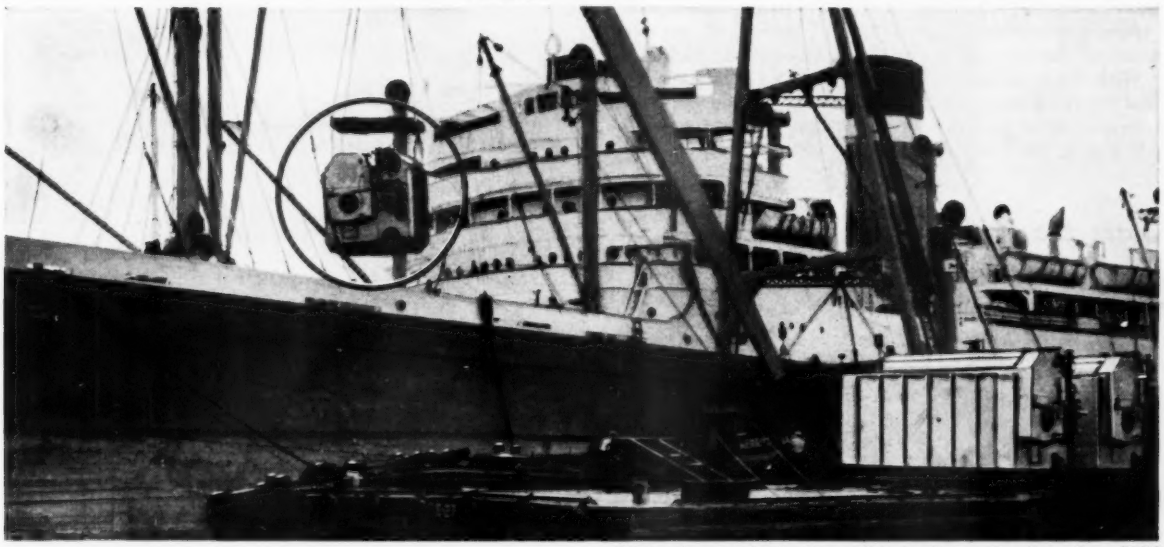
Since ball and roller bearings are often the most vital and most important parts in a machine, they logically carry a high priority for correct lubrication.

Proper lubrication of ball and roller bearings in machines increases the earning power of a plant by eliminating delays and down time caused by trouble with bearings and related parts. Lubricants are available for the many and varied re-

(Continued on page 160)

keeping steam cheap . . .

BOILERS FOR Bombay



Off to a long productive "career" in foreign service, these three B&W Type FM Boilers are hoisted aboard ship at New York for the long voyage to Bombay, India. They will be followed shortly by another one.

more and more **B&W** Type **FM** Units are going into foreign service

Loading for their trip to the other side of the earth, these three B&W Integral-Furnace Boilers, Type FM, typify the growing demand for these compact, shop-assembled units by industries in many parts of the world. Ordered by the Standard-Vacuum Oil Company for their new Stanvac Bombay Refinery in India, these self-contained, B&W steam-generating units each will provide 20,000 lb of superheated steam per hr.

A water-tube unit with a fully water-cooled furnace, the B&W Type FM Boiler is designed for indoor or outdoor operation . . . is suitable for single or multiple-unit installation . . . is simple in operation, with push-button start and stop, and automatic control for meeting quick load variations. Delivered assembled, the FM Boiler is ready to be lifted or skidded into position, connected to fuel, water, and electric services, and put to work.

Combining the benefits of "packaged" steam with the advantages of big boiler design, the versatile B&W Type FM Boiler is being selected for more and more foreign installations . . . is already serving a wide variety of domestic industries, utilities, and other users. FM Units having a total steam capacity of over 7,000,000 lb per hr are now in service or on order. Available in standard sizes for loads ranging between 2900 and 28,000 lb of steam per hr at pressures from 15 to 235 psi, B&W's "midget workhorse" is also obtainable for operation at higher pressures.

OTHER COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space

Write for Bulletin G-76 for full details about this unique, small boiler. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-627

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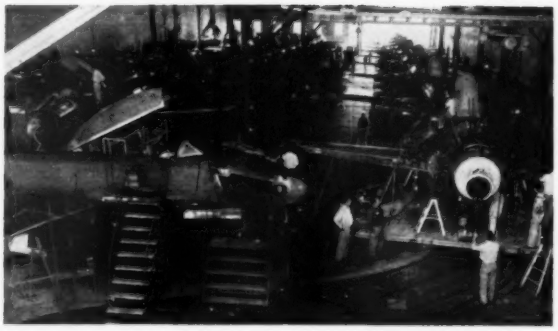
Non-Stop Production Line Turns Out Jet Planes at Fast Pace

Manhour savings of more than 3000 per month are being realized on the T-33 jet trainer production line at Lockheed Aircraft Corporation's plant in Van Nuys, Calif. Installed to replace the formerly used step-by-step system, the new line, which moves continually, travels down one side of the hangar, makes a U turn, and goes back along the other side during its over-all travel length of 725 feet. Spaced along the line are 22 separate assembly stations, where individual components of the plane are attached to the basic airframe.

With the mechanized line, installed at a relatively low cost approximating $60,000, production of the 600-mph two-seat T-33 jets (standard jet trainer for the U. S. Air Force, Navy and Marines) is now rolling.



Giant Manipulator with a Baby's Touch Functions in Radioactive Areas

Developed to operate in radioactive areas where men cannot work, a 15-ton remote controlled overhead manipulator will make possible the assembly or disassembly of large machinery by twisting a knob or flicking a lever on a control panel.

Pushbutton operations in buildings designed to prevent the escape of radiation are necessary in certain types of atomic energy work. The overhead manipulator (called O-man) operator will work through special glass windows with the aid of binoculars or a telescope.

Principal use of the manipulator will be to pick up heavy parts, position them and fasten them into place. It can drill and tap holes, use power wrenches, hammers or riveters, and if need be, handle a sheet metal saw.

The big device will operate from a crane bridge, with vertical maneuverability ranging from floor level to the height of the crane bridge.

Portable Kits Demonstrate Explosive Hazards of Dust and Gas

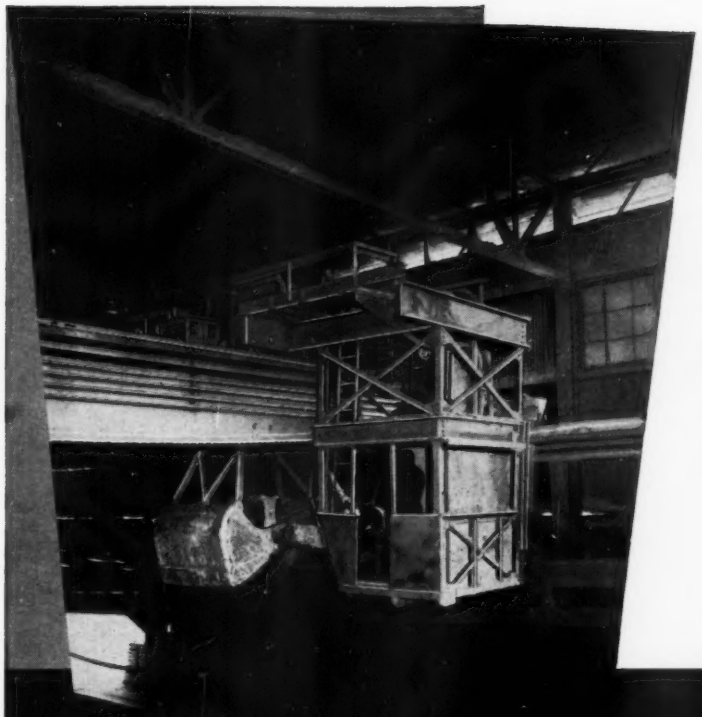
Field representatives of Crouse-Hinds Co., Syracuse, N. Y., are demonstrating explosion-proof and dust-tight electrical equipment with portable kits.

Their demonstrations are being given to groups of electrical inspectors, electricians, engineers and plant maintenance men all over the country. Objectives of the presentations are built around the presence at hazardous locations of one of two conditions: either that unprotected electrical circuits ignite flammable gases or vapors; or that dust particles, by blanketing ordinary electrical fixtures with a heavy layer of dust or by mingling with the air about such fixtures, can cause fires and explosions.

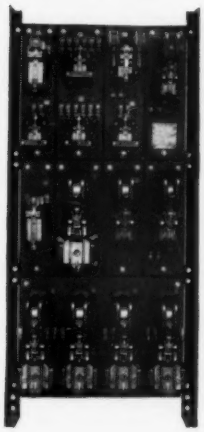
To illustrate these conditions, explosions are set off in lighting fixtures, mounted in the portable units. Preparatory step for one such explosion is mixing air and propane in flow meters. The test box contains an explosion-proof lighting fixture and a Plexiglas tube containing an ordinary fixture. Propane gas mixtures, fed into the fixture and the tube, are exploded by arcing spark plugs mounted in each gas-filled container.

"Leakage" of the explosion through the ordinary fitting fixture demonstrates the hazards of electrical sparks in atmospheres of this nature.

Another unit of the portable kit is used for demonstrating the explosive qualities of dust. By blowing dust past a glowing resistance wire in a glass tube, an explosion is created.



This EC&M Braking Panel replaces all mechanical braking devices in southern fertilizer plant and operates satisfactorily in severe acid atmosphere.



Change-Over to Dynamic Braking Control by EC&M Results in Smoother, Safer Operation of Bucket Cranes

Dynamic Braking Bridge-Stop Control provides an all-electric braking system in which the **driving** motor also acts as the **braking** motor. Operator applies normal stopping by means of a 2-position foot switch which gives two points of dynamic braking depending upon the speed of the crane and the accuracy of stopping desired. Should power fail, dynamic braking is automatically applied to bring the crane to rest quickly, regardless of the position of the master switch.

SOMETHING had to be done! One of the cranes in this plant had partially jumped the runway when power failed at instant of plugging. Ordinary braking methods failed. Magnetically-released, mechanically-set brake wore down rapidly under hard service. Motor burnouts, shaft and gear failures spelled costly delays. Repairs were a nightmare.

So, a change-over was made to all-electric braking. This eliminated costly production delays. Maintenance became merely a routine inspection of motors and controllers. Operation became 100% satisfactory. And the operators warmed up to the smoother stopping.

Dynamic Braking Bridge-Stop Control offers advantages for your cranes. May we send you Bulletin 921-6.0?

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

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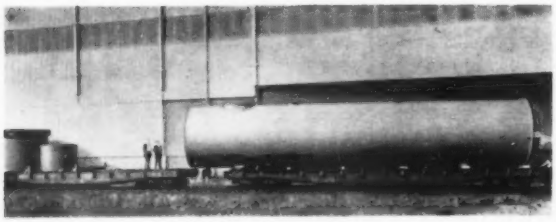
Giant Silencer Takes Noise Out of Generating Unit



Designed to silence the exhaust of a 5000 kw simple cycle gas turbine generating unit installed at a Midwest utility company, this silencer is believed to be the largest ever built.

It measures 74 ft long by 12 ft in diameter, and has an estimated weight of 70,000 lb. Because of its size and weight, it was necessary to ship the silencer in three sections.

It was designed and built by Burgess-Manning Company of Libertyville, Illinois.

Automation, Shown in Movies and Displays, Gets a Ride to Industry

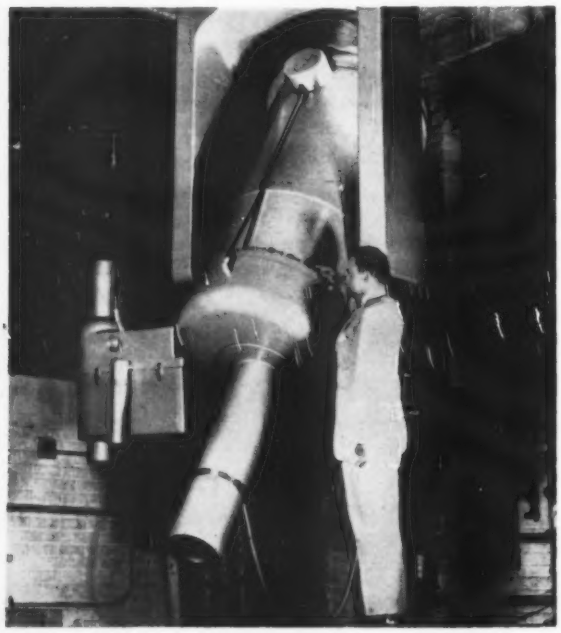
Automation, one of the hottest industrial subjects today, has been put on wheels by the Standard Control Division of the Westinghouse Electric Corp. A traveling display coach has logged mileage all over the country, and has been shown to engineers, maintenance people and plant executives in the machinery manufacturing industry. The coach will ultimately tour to a total of 350 plants in all parts of the U. S.

A mobile combination of an auditorium and exhibit hall, the coach shows how common electrical devices such as linestarters, control stations, motors and circuit breakers can be used to achieve successful automation.

Westinghouse takes the coach to a customer's plant and runs consecutive 1½-hour programs for groups of ten to twelve engineers at a time. As introduction, two movies, appropriately titled "Automation Economics" and "Automation Mechanics," are shown.

Super-Voltage Radiography Makes First Appearance in Industry

Capable of penetrating steel thicknesses up to 12 in., a two-million-volt Van de Graaff X-ray generator will be used in photographing weld metal to detect flaws, holes or scale that may form in metal processing. It will be a major tool of the new Foster Wheeler Corp. plant at Mountaintop, near Wilkes-Barre, Penna. First super-voltage X-ray machine of its type to be installed for industrial radiography, the unit will examine weld structures, using fewer exposures and considerably less time than conventional equipment.



The unit will be housed separately in a massive concrete structure and to assure the safety of plant personnel in the event of escaping rays, elaborate precautions were taken in the building design. Walls four ft thick rise 35 ft on the side fronting the main plant and 25 ft on the remaining three sides, and the building was erected 550 ft from the main plant, affording further protection to the employees.

A concrete door, 18 ft wide and 19½ ft high, weighing 108 tons, will serve as an entry for flatcars delivering parts to be X-rayed. Personnel will enter the developing and inspection sections through a maze of walls. In position, the X-ray generator will be suspended on tracks from a crane trolley that will provide travel over the plan area of the house, as well as vertical drop of 24 ft. The x-ray machine body is supported so as to provide vertical rotation of 180 deg and horizontal rotation of 360 deg. Operation of the generator will be controlled from a desk-type console in an adjoining room.

Originally developed for cancer therapy, this type of machine is making its bow in industrial application.

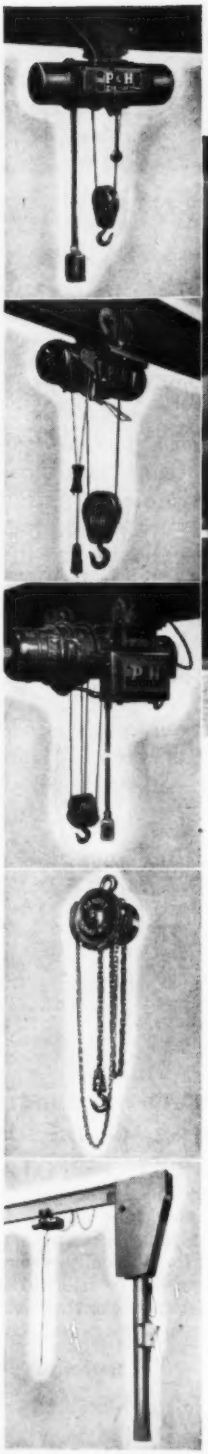
P&H Zip-Lift Electric Hoist (Pushbutton control)
Handy little power-house for loads from 250 pounds up to one ton. Versatile — in use in metal shops, dairies, hospitals, bakeries. Solves your load-handling problem within the weight limits specified. Plenty of literature available for more detailed information. Ask for it.

P&H Zip-Lift Electric Hoist (Rope Control)
You can do anything with the two rope controlled models that you can with the Pushbutton Zip-Lift. The less expensive rope control gives you a break on price — doesn't cut down the number of jobs you can perform. You get years of trouble-free service at an extremely reasonable initial cash outlay.

P&H Hevi-Lift
For heavy loads — and your own particular problem. The Hevi-Lift is a custom-built hoist — manufactured to your specifications. Over 3,000,000 variations possible on this husky load-handler. You're sure to find the right combination for you. Take a look at the literature available — then see your P&H distributor for a concrete solution.

P&H Hand Chain Hoists
Perhaps you're in the market for a hand chain hoist; rather than wire-rope. If you are, you'll have to look far to find a better value than these P&H work-horses. Handle up to 25 tons easy as pie. Spur-geared; Timken or roller bearing trolleys; Army-Type trolleys — whatever you need. Ask for literature on the complete line.

P&H Jib Cranes
Hang your hoist on a P&H Jib Crane — then you've got a dependable one-two combination working for you. Eight different models — bracket-type, mast-type and pillar-type. Capacities up to 12,000 pounds. Use the coupon for fast return of literature on the complete P&H Line.



How to solve your load-handling problems *at less than 10¢ per day* with versatile, hard-working P&H HOISTS!

LET Mr. Harold Tinus, of the Tinus Marine Service in Oconomowoc, Wisconsin tell it. Says Mr. Tinus:

"In the summer of 1953, our sixth season of marine service, we were able to install two 1,000 pound capacity P&H Zip-Lift Hoists on an I-beam above the cross runway of our building, and really take advantage of their labor-saving and back-saving power, to handle customers' boats. Never again, if we can help it, will three or four men wrestle with a boat to transfer it from an outdoor trailer to an indoor cradle, when one man — simply by pulling control cords — can hoist it better than a dozen feet a minute and put it right where we want it.

"After six months of service we had a cost analysis made to determine the economics of our operation. The results amazed us. We found that for each day of operation of each P&H Hoist, our costs were only 9.7¢! That's less than the cost of a telephone call!

"That's *actual cost*. We can't attempt to evaluate the savings we've made in freeing workmen for other, skilled labor — rather than wrestling boats around our storeroom.

"And the best part of it is that by using the P&H Hoists we're able to handle more business — and the more we use our hoists — *the less they cost us!*"

This case history is just one of many, in many fields. A visit from a P&H representative can show you how you can make the same kind of savings in your business. Use the coupon below for information on the complete P&H Hoist Line.

This coupon and a 3¢ stamp gets you complete information on the P&H Hoist Line. ➧

P&H HOISTS

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P&H Hoists
HARNISCHFEGER CORPORATION
4696 West National Ave., Milwaukee 46, Wisconsin

Gentlemen: I'm interested in the savings I can effect with P&H Hoists. Send me more information on Mr. Tinus' experience. I'd like to know more about P&H Zip-Lift, Pushbutton Control ☐, P&H Zip-Lift, Rope Control ☐, P&H Hevi-Lift ☐, P&H Chain Hoists ☐, P&H Jib Cranes ☐.

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Important News

for users of industrial electronic equipment

NEW SIMPLIFIED ELECTRON TUBE INVENTORY PLAN

If your production line operation depends on vital electronic equipment, an unexpected shortage of key tube types could cause trouble.

To help you guard against a possible equipment shutdown, your RCA Tube Distributor now offers a new *RCA Tube Inventory Maintenance Plan* . . . designed to take the guesswork out of your tube inventory control. This plan enables you to set up accurate reserve stocks and helps to assure smooth and uninterrupted production-line operation.

There's nothing for you to sign . . . nothing for you to buy to get the plan started. Your RCA Tube Distributor will analyze your tube requirements and prepare a suggested tube inventory—tailored to your equipment and your operation. There is no charge or obligation for this service.

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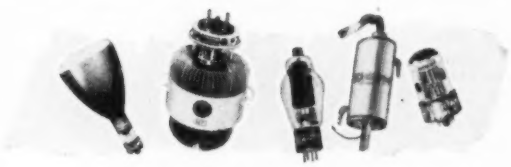
The services of your RCA Tube Distributor are as close as the telephone on your desk. When you buy through your local RCA Distributor, you simplify and centralize ordering procedures. Your RCA Tube Distributor acts as your local warehouse . . . assures you of quick, dependable delivery from his large and well-balanced stocks. You'll find him friendly, courteous, ready to help you with your tube requirements.



DEPENDABLE PRODUCTS DESIGNED FOR THE JOB

RCA Industrial Tubes offer you high quality and long service life. Developed specifically for industrial applications, they can be counted on to deliver reliable performance. There's an RCA tube for virtually every kind of electronic equipment in use. So when you replace, use RCA tubes for that extra margin of dependability and operating economy

For prompt, expert service on your tube requirements, rely on your local RCA Tube Distributor

RADIO CORPORATION of AMERICA

ELECTRON TUBES **HARRISON, N.J.**

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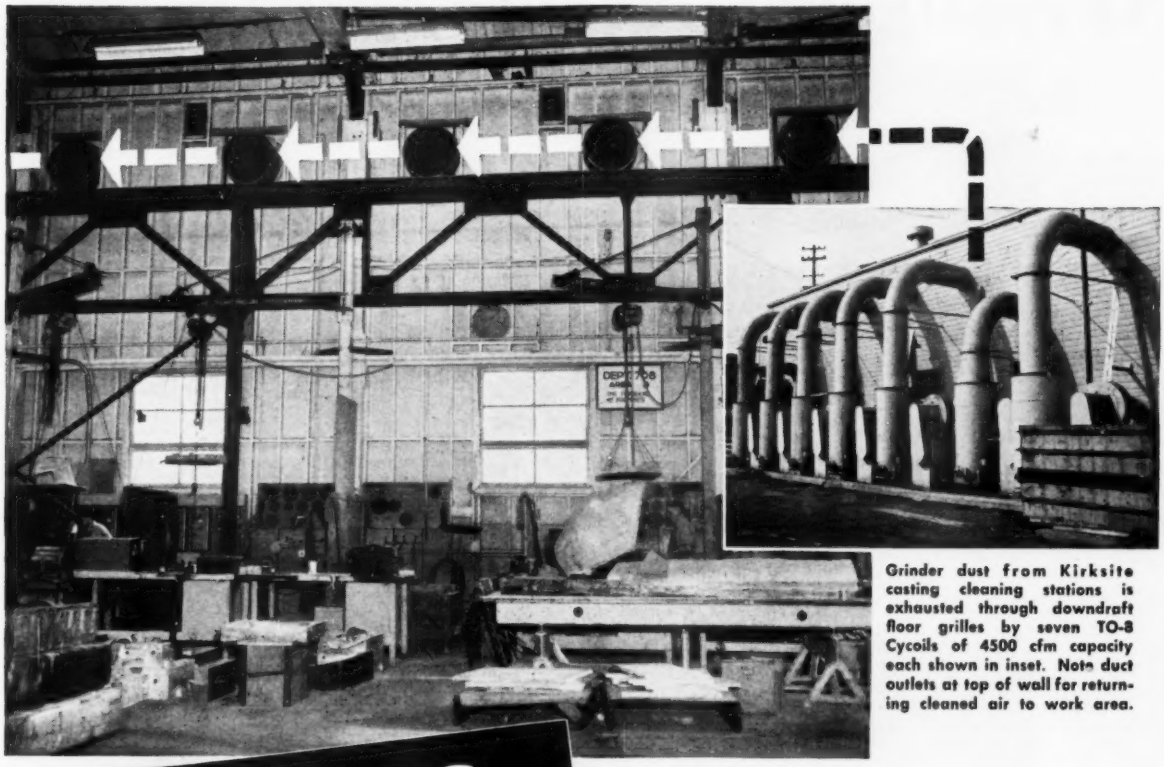

Grinder dust from Kirksite casting cleaning stations is exhausted through downdraft floor grilles by seven TO-8 Cycoils of 4500 cfm capacity each shown in inset. Note duct outlets at top of wall for returning cleaned air to work area.

CYCOILS REMOVE DUST and RETURN DOLLARS AT BOEING!

SEATTLE INSTALLATION Results in Clean Plant with Definite Heat Savings from Cleaned Air Return

Boeing Airplane Company, Seattle, Washington, scored a direct hit on dust with the application of Cycoil Air Cleaners to their Kirksite die finishing operations. It is apparent to the eye that they achieved their major objective—a clean plant. What you don't see are the cash dividends received in heat savings resulting from the return of cleaned air.

The TO-8 Cycoil is a specialist. This oil bath air cleaner is designed for handling the removal of the lighter dust concentrations common to so many metal working operations. Serving as a collector or after cleaner, Cycoil's unique triple cleaning action results in the high efficiency which permits recirculation of this cleaned air.

If you want to clean up dust and cut down heating costs, the TO-8 Cycoil deserves a prominent spot in your plant. For complete information on this and other AAF Dust Control Equipment, call your local AAF representative or write us direct.

American Air Filter
COMPANY, INC.

228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

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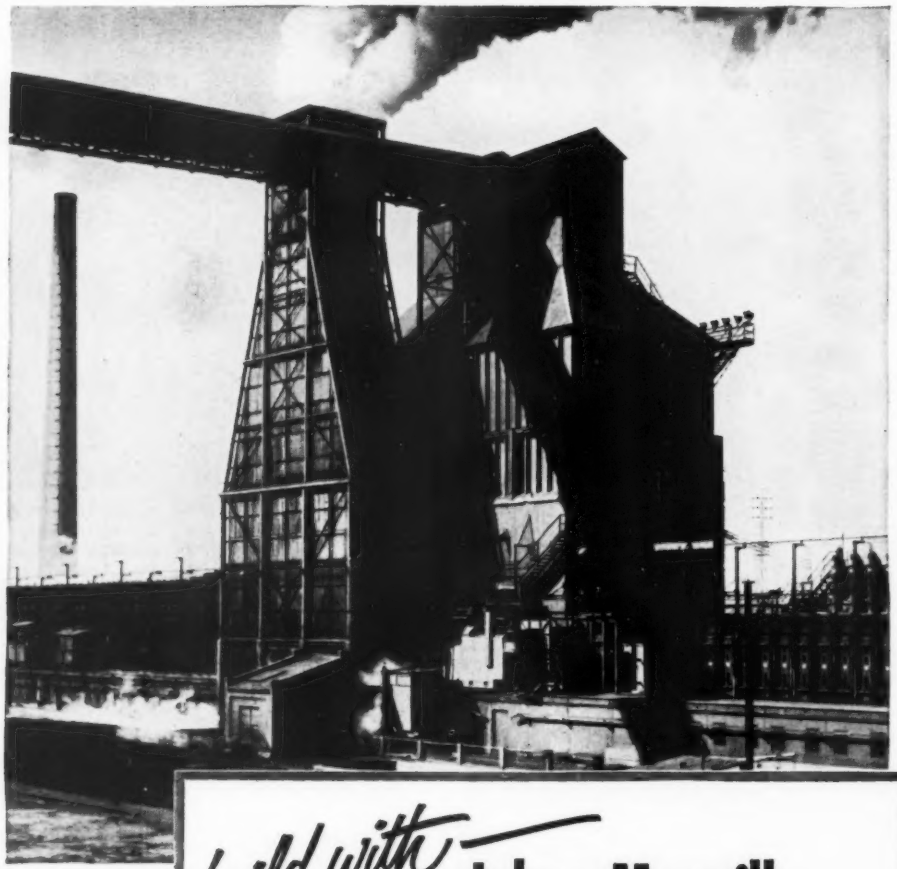
No costly maintenance problem here



So severe are the steam and fume conditions in this coke quencher station, that the heavy structural steel framing is on the *outside*, protected by J-M Corrugated Transite

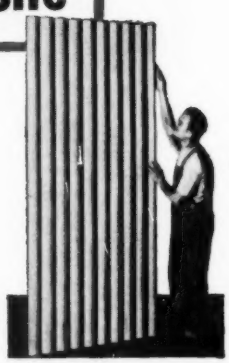
build with Johns-Manville Corrugated Asbestos Transite

For permanent, maintenance-free construction, plus protection from fire, rot and weather

YOU SAVE MONEY on construction and maintenance when you build with J-M Corrugated Transite®. Corrugated Transite comes in large sheets that require a minimum of framing . . . permit fast economical construction of maintenance-free industrial, commercial, institutional and agricultural buildings.

Made of asbestos and cement, Corrugated Transite is practically indestructible. It never needs paint or special treatment to preserve it . . . it's fireproof, rotproof and weatherproof. Corrugated Transite is also used increasingly for smart interiors . . . the streamlined corrugations and attractive shadow lines that give it such unusual architectural appeal for exteriors offer unlimited interior design possibilities.

Investigate Johns-Manville Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details write Johns-Manville, Box 158, Dept. PE, New York 16, New York. In Canada write 199 Bay St., Toronto, Ontario.



- Large sheets go up quickly
- Easy to fasten to steel
- Easy to nail to wood
- Easy to saw
- Easy to drill

JOHNS-MANVILLE PRODUCTS

Johns-Manville

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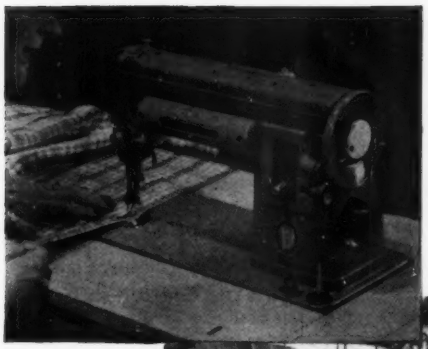
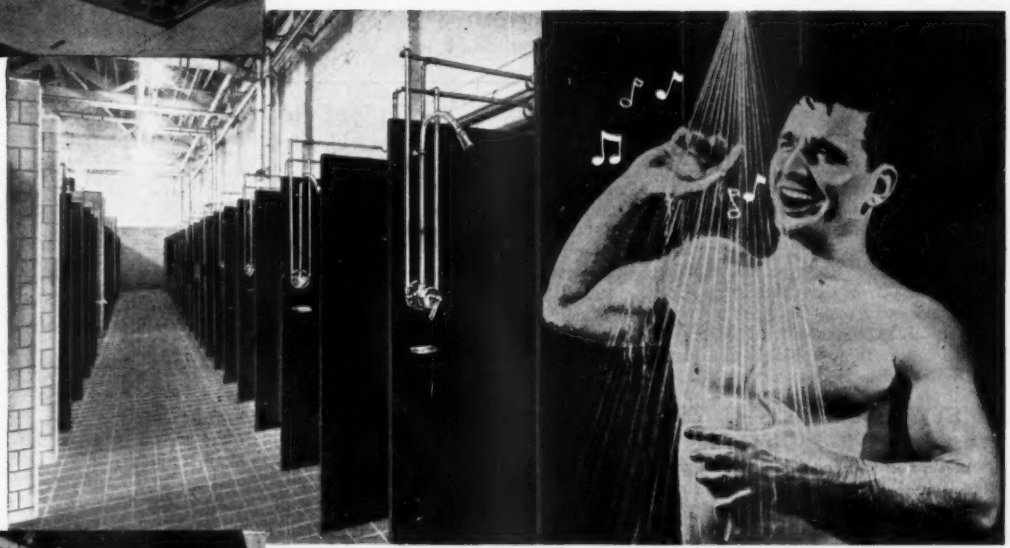
Workers Sing in the Showers
Regulated by POWERS
at The SINGER MANUFACTURING CO.
Plant in Elizabethport, New Jersey



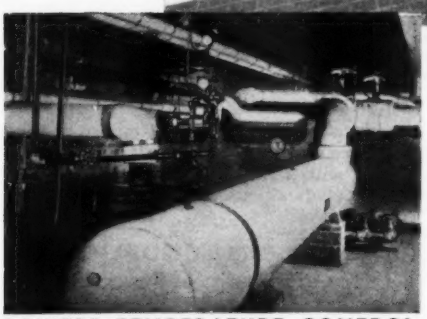
Above:
A magnificient new model in the already world-famous line of SINGER Sewing Machines

•

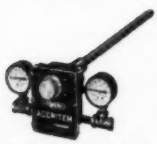
Right:
One of Singer's Shower rooms has 98 showers, another 58 and there are several smaller ones for individual groups.



Some of the 190 Clean, Modern Showers at The Singer Mfg. Co. Each shower is individually controlled by a



POWERS TEMPERATURE CONTROL on HOT WATER GENERATORS



serving the various shower rooms is shown above. For this type of service a Powers ACCRITEM Regulator and FLOWRITE Valve are often used.

When You Have Problems of Water Temperature Control contact Powers nearest office. With over 60 years experience and a most complete line of controls we are well qualified to help you.

Mixer for Exposed Piping

POWERS

Thermostatic WATER MIXER

The Best Showers that money can buy — is only one of the many reasons why employees remain almost twice as long with SINGER as the national average.

Mr. F. H. Gummick, Plant Engineer for this famous 100 year old firm, says "The Singer Mfg. Co. has provided employees with the best shower room equipment obtainable. We consider it an investment in good employee relations."

Powers Temperature regulators on each individual shower as well as on the hot water generators serving the showers is the best insurance for a SAFE, COMFORTABLE shower.

No Unexpected "Shots" of icy cold or scalding water here. Powers *thermostatic* water mixers always keep the water temperature just right — regardless of **pressure** or **temperature** changes in water supply lines. Write for catalog Rb24.

(b14) • ***Only ONE Shower Accident Can Cost Many Times More Than POWERS Water Mixers*** •

Established in 1891 • THE POWERS REGULATOR COMPANY • SKOKIE, ILL. • Offices in Over 50 Cities

For more facts circle 570 on Reply Card

NEW PRODUCTS & PROCESSES

summarized for your convenience

Edited by M. E. Heniken

1—CONVEYOR BELT COVER resists abrasion, tearing

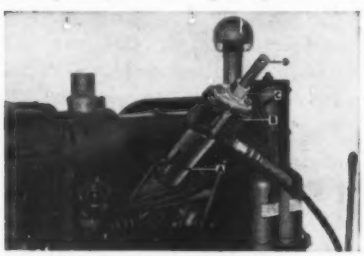
A conveyor belt cover, the XDC, said to offer high resistance to abrasion and tearing and thus prolong conveyor life, is being applied to many of this manufacturer's conveyor belts. It is considered particularly advantageous for belts operating under heavily abrasive conditions, such as with ore, rock and coal. The XDC was developed as a result of findings reported to show that most final conveyor belt failures are due to cover wear through abrasion and tears—and that the abraded or torn sections expose the internal strength members (fabric or plies) which deteriorate upon exposure. The new belt cover is designed to provide a true balance of wear between strength members and cover besides giving high flex life and resiliency, Manhattan Rubber Div., Raybestos-Manhattan, Inc.

2—KEYWAY BROACH KIT covers many hole sizes

To meet a demand for a keyway broach kit covering all hole sizes in ⅛-in. and 1/16-in. increments, the 1-1A Minute Man Combination Kit is offered. This useful kit provides broaches and bushings for standard width keyways in 18 bore diameters conforming to American key standards. By interchanging broaches and bushings 36 combinations of keyways can be cut. Kit is available with broaches in either carbon or high speed steel. The duMont Corp.

3—PRE-CUP PULLER for use on diesel engines

An improved puller for removing the pre-combustion cup on International diesel engines is announced. The tool is described as fast operating and providing a more positive grip which permits pulling of all cups regardless of



condition. It consists of three sizes of expanding collets which grip the inside diameter of the cup, an expanding screw which tightens the collet in the cup, a puller screw (D in illustration), sleeve (A), forcing nut (C) and manufacturer's Power-Twin Ram (B) when used hydraulically. The tool can be used manually as well; then the ram is not used and the nut is turned with a wrench. Owatonna Tool Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards on pages 37-38 and 167-168.

4—GRINDING WHEELS of depressed center design

Carboflex depressed center grinding wheels for rough grinding, weld removal, cut-off and slotting operations for ferrous and nonferrous metals and non-metallics, are designed to combine aggressive cutting action with high strength and resistance to cracking. These new glass-fiber-reinforced resin bond wheels are also claimed to provide efficiency with maximum safety.

Designed with a knurled back in addition to the knurled face, these wheels enable the operator to cut with both sides and the periphery of the wheel without any initial dressing, says manufacturer. The wheels come in diameters of 7 and 9⅛ in., and in thicknesses of ⅛, $\frac{3}{16}$, and ¼ in. and contain a ⅞ in. arbor. Grading A24-R-BC is suggested for metal applications, C24-R-BC for non-metallics. The Carborundum Co.

5—WET BLASTING MACHINE for precision cleaning

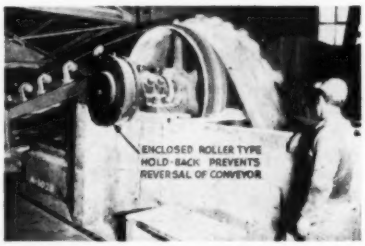
Model 30 Liquamatte wet blasting machine is designed for all types of precision cleaning and finishing operations for small parts which can be lifted and handled manually, and can go through a door opening, 22½ in. by 19 in. It may be used for heat treat scale removal; fine deburring; prolonging cutting tool life, reconditioning of valves, pistons, rods; reconditioning plant equipment such as oil burners; and cleaning oxides from tungsten carbide tips before brazing them to cut tools. Bulletin 93 gives specifications. American Wheelabrator & Equipment Corp.

6—SILENCERS, absorption-type, intake-exhaust units

Two new series of silencers for quieting noise produced by air compressors, blowers, vacuum pumps and other machines expelling high velocity air to atmosphere, will be known as the Series CA and LCA. They are designed for operation under moisture-free conditions and for temperatures to 200 F. Both series are absorption type silencers employing straight-through acoustically transparent perforated tubes surrounded by a deep layer of sound absorbing material. (Special sound absorbing material can be used for operation at higher temperatures than the standard of 200 F.) The CA Series is available in pipe sizes up to 6 in., and the LCA Series in sizes larger than 6 in. Burgess-Manning Co.

7—HOLD-BACK to prevent reversal of bucket elevators

The S-A Enclosed Roller Type Hold-Back is designed to prevent reversal of bucket elevators and inclined conveyors due to power failure under load. It consists of an inner member with wedge pockets for six hardened rollers which



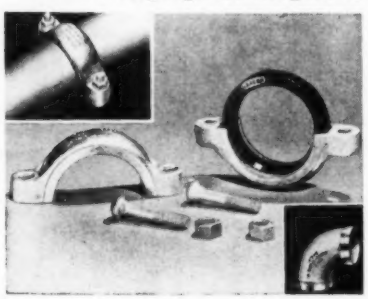
rotates with the shaft. When the shaft attempts to reverse, the rollers wedge against an outer cylinder. Pressure springs and plungers are utilized for instant engagement of rollers, and the hold-back releases when forward motion of the shaft is resumed.

This hold-back mounts directly on the drive shaft, with the torque arm bolted to a support with sufficient strength to resist the load exerted when reversal occurs. Maximum torque resistance ranges up to 350,000 in-lb for units with a maximum bore of 7 in. Full details are given in Bulletin 444X. Stephens-Adamson Mfg. Co.

8—ALUMINUM COUPLINGS for grooved aluminum pipe

Aluminum Gruvagrip Couplings and Fittings were developed as a result of increased production of aluminum pipe. They are announced as suitable for use wherever extremely light, high pressure pipe systems are needed, and are available in 2-, 4-, 6- and 8-in. sizes. The 8-in. aluminum coupling weighs less than 11½ lb complete.

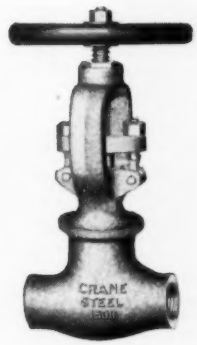
The new couplings are designed to

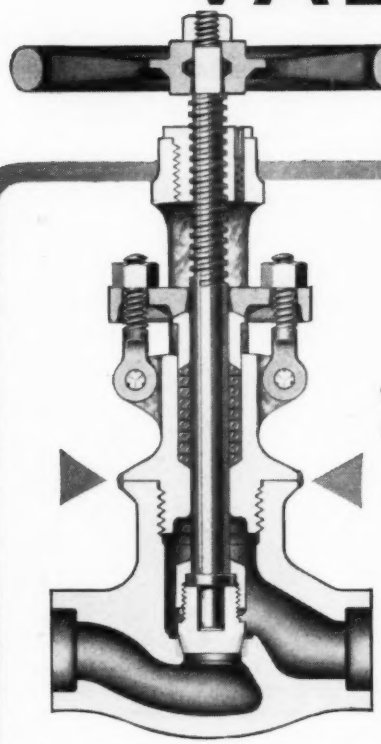


automatically absorb expansion and contraction, shock, ground motion and vibration. Manufacturer says they re-

newest in small steel valves for high-pressure/high-temperature

CRANE
lip-seal bonnet (patented)
VALVES





Lip Seal design is exceedingly simple. Body and bonnet are screwed together until a firm metal-to-metal contact is made between the smoothly machined flat surface on the shoulder of the bonnet and the top of the body. The small lips around the periphery are then seal welded.

- **Absolute Bonnet-Joint Tightness**
- **Freedom from Bonnet-Joint Maintenance**
- **Minimum Weight and Bulk**
- **Easier Dismantling and Reassembly**

1500 AND 2500-POUND GLOBE AND ANGLE PATTERNS
SOCKET-WELDING AND SCREWED ENDS. SIZES ½ TO 2-INCH

What better way to seal against leakage at the bonnet joint of a small steel valve . . . than with a simple weld. And that's all the weld is ever called upon to do. Extra-long body-bonnet threads carry all mechanical loads—and at comparatively low stresses. Should dismantling be necessary, the seal weld may be repeatedly ground off—and reapplied—without damage to valve.

Right along with this modern Crane sealing principle go other important refinements. You get a compact, weight-saving structure without sacrificing strength or reducing seat area—a more rigid swivel disc-stem connection—durable Stellite-faced plug-type disc—and Stellite-faced integral seat.

Crane Lip-Seal Bonnet Valves are by far your best buy for high-pressure/high-temperature power services . . . worthy companions to the larger Crane Pressure-Seal Valves. Ask your Crane Representative for Circular AD1902, or write direct.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more facts circle 571 on Reply Card

Removes 2 TONS of incrusted dirt in less than 8 HOURS!

IN ONE OPERATION a Tennant Machine cuts grime from floor . . . picks it up. Many models, electric or gas. Also 36" and 24" high speed POWER SWEEPERS for dust, litter, debris.

AN EASY ONE MAN JOB WITH THE

TENNANT INDUSTRIAL FLOOR MACHINE

Pulverizing and shearing thick hard grime from floors at the amazing rate of 8 to 20 lbs. per *minute*, the Tennant Industrial Floor Machine makes a fast, easy job of *any* floor-cleaning assignment, no matter how tough!

Removes hardened tar, grease, dried paint, cement splashes and similar material like magic.

Guaranteed to do the job!

REVO-tool pulverizes and removes thick incrusted grime. Provides over half million impacts per min

The way to finer floors
TENNANT
Floor Maintenance System

FEATURES

- **REQUIRES ONLY 1 MAN**
- **PICKS UP SOILAGE** as it goes. Eliminates extra sweeping.
- **SMOOTHS AND LEVELS** surface while cleaning. Leaves floor hard, dry, ready for traffic.
- **ELIMINATES CHEMICALS** or need for soap and water
- **NO INTERFERENCE** with normal plant operations.

Write Today!

Get full details about the results you can get with Tennant Floor Machines . . . or Tennant Power Sweepers.

Tennant 24" Power Sweeper for fast sweeping in busy plants.

G. H. TENNANT CO.
2572 N. 2ND ST. • MINNEAPOLIS 11, MINN.

NEW PRODUCTS

(Begins on page 120)

main leakproof under end pulls up to 46,000 lb; permit layout misalignment up to 3 deg; withstand temperatures between 200 F and -65 F. They can be removed and re-used, and are suggested for permanent or temporary lines carrying air, vacuum, gases, water, oil and chemicals. The sealing gasket is resilient synthetic rubber designed to resist deteriorating effects of oil and chemicals. The aluminum fittings are machined to standard grooving dimensions and available in 90- and 45-deg elbows, tees, caps and nipples. Gustin-Bacon Mfg. Co.

9—SEMI-STEEL VALVE of grooved-end construction

A new grooved-end version of this company's standard two-bolt yoke type semi-steel lubricated plug valves is offered to make it possible to connect valves to steel pipe with grooved end couplings. It is explained that with this method, a tight, permanent connection can be made in minutes, and lines may be dismantled as often as necessary without damage to the pipe or grooved end couplings. This method is also said

to eliminate the need for level ditching because a deflection of several degrees at every joint allows the lines to follow uneven ground contours. This flexible connection also serves to offset pipe vibration and to overcome the problem of expansion and contraction.

Industrial applications for this new Nordstrom Fig. 23144 Valve include its use in water and fuel lines, disposal lines, transportation lines, air and cooling lines and fire protection systems. The valve is wrench operated and has a pressure rating of 175 psi, WOG. It comes in 2-, 2½-, 3- and 4-in. sizes. Rockwell Mfg. Co.

10—SEALED CASTERS lessen need for lubrication

New 3D Series H99 Casters feature three advanced design innovations reported to virtually eliminate the need for caster lubrication. These are: a main swivel bearing baffle ring to keep out dirt and water; a grease retainer to prevent loss of swivel lubricant due to

For more facts circle 572 on Reply Card

Black & Decker

Cases for Comment

MAINTENANCE

(Case History 4820)

Black & Decker Drill, 16 years old...still going strong.

CONSTRUCTION

(Case History 7338)

Copper roof batting installed 20 TIMES FASTER than old methods with B&D Power.

PRODUCTION

(Case History 10691)

Black & Decker Drill speeds up production and operation 100%.

Hall-Neal, Indianapolis, Ind.

Hall-Neal manufactures furnaces, installs them and air-conditioning equipment. Photo shows ¼" B&D Drill used to drill hole in 22 gauge steel. Also used for general maintenance. The use of the drill has resulted in 100% speed up in operation and production. Company also uses B&D Screwdriver, Heavy Duty Grinder. Some on job 8 hours a day, 5½ days a week for 10 years.

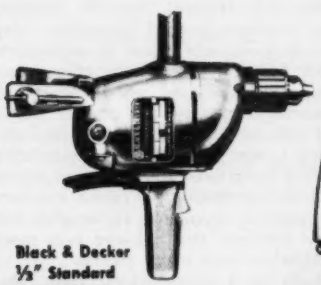
Jim - Note this proof of long trouble-free service

In thousands of cases, industry finds Black&Decker Power gives production a big boost

Here's power to drive drills (and saws, grinders, hammers, screwdrivers) . . . produce more per machine . . . per man-hour.

Here's power *custom-built* for the job. Power built into every B&D Portable Electric Tool because every B&D Tool is driven by a B&D-built motor. And every B&D Tool is built to the latest design with husky housings, precision parts. Year in, year out you can depend on B&D Tools to do the job faster . . . saving time, trouble, money, and manpower.

Don't just take our word for it. Ask around industry. Ask production specialists. Ask time and motion experts. Then try Black & Decker Drills . . . Black & Decker Power. See your B&D Distributor for demonstration. And write today for free, detailed catalog. Address: THE BLACK & DECKER MFG. CO., 611 Pennsylvania Ave., Towson 4, Maryland.



Black & Decker ½" Standard Electric Drill

Black & Decker ¼" Heavy-Duty HOLGUN* Drill

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

BD

* Trade Mark Reg. U. S. Pat. Off.

For more facts circle 573 on Reply Card

PEAK TEMPERATURE AND PRESSURE EXTREMES

HOT
1000° ABOVE ZERO F.

Petro Unions conform to a recognized American dimensional standard (Association of American Railroads) better known as A.A.R. and will interchange with all other A.A.R. unions.
The ends and nut are octagon in shape. The ends are tapped to Briggs Standard steam threads.
Nut threads are rustproof, spark-proof, and permanently lubricated with Udylite Cadmium.
The seats are machined on fine precision production machines. The female seat is cold rolled with minimum differential in hardness of 40 points (Brinell) maintained between the male and female seats to safeguard against seizure or gauling on temperatures to a 1000° F.

PETRO A.A.R.

SCREWED OR SOCKET-WELD

Petro unions will perform with perfect satisfaction on any type of service including ammonia refrigeration. Pressures to 900 pounds S.W.P. or to 3000 pounds C.W.P. The greatest value ever offered in a forged steel union.

COLD
100° BELOW ZERO F.

C. M. & CO. ORIFICE

For flow control of steam, oil, ammonia, chemicals, water, gas, air. Also for metering and measuring.

Recommended for working pressures of 600 lbs. at 850 degrees fahrenheit, or 3000 lbs. at 150 degrees fahrenheit.

Furnished with 18-8 stainless steel orifice plate and steel-jacketed asbestos filled gaskets.

Illustration shows the orifice plate and gaskets set in a groove of solid steel to facilitate ease of tightening and safeguarding against blowing of gaskets and resultant trouble.

Nut threads of the union are Udylited (cadmium plated) for permanent thread lubrication.

SIZES ¼" to 3"

ORDER BY TRADE NAME FROM YOUR LOCAL JOBBER

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912

CLAYTON MARK & COMPANY

1900 DEMPSTER STREET • EVANSTON, ILLINOIS

For more facts circle 574 on Reply Card

NEW PRODUCTS

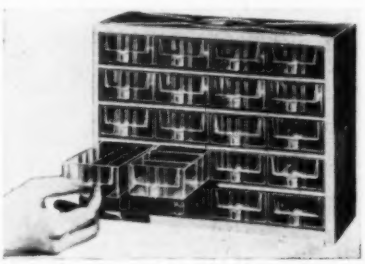
(Begins on page 120)

vertical drainage, and a wheel bearing seal to exclude foreign matter and retain lubricant.

Both the swivel and wheel bearings are free of drag, company claims, since they have no preloaded frictional contact with moving parts. The seals are designed to permit flushing out of old ineffective lubricant, when required, by merely regreasing through use of standard pressure lubrication equipment. The Bassick Co.

11—DRAWER CABINET keeps small parts in sight

Designed for visible storage of small parts, See-Thru Drawer Cabinets have clear plastic drawers which manufacturer says are spillproof and lifetime-guaranteed. The popular Model J-20 has 20 of these drawers in a welded



steel cabinet with silver-gray finish and rubber feet. Individual drawers are 5⅞ in. long by 2¾ in. wide by 1-7/16 in. high, and the cabinet itself is 10¼-in. high, 12½ in. wide and 6 in. deep. Adjustable drawer dividers and identification labels are included and the unit costs less than $8.00 postpaid.

Other cabinets have from eight to 128 drawers, some have larger size or metal drawers and some have carrying handles. Over 750 combinations can be supplied to suit individual plant requirements. Descriptive literature is offered. General Industrial Co.

12—LATEX RESIN PAINT for problem walls, ceilings

Luminall Stipple Texture Paint transforms old, cracked, uneven surfaces into interiors free of blemishes, says manufacturer, and is also an economical finish for dry-wall construction, concrete, brick, painted wood and metal. A money-saving feature pointed out is that this new formulation plasters and paints in one operation, no preliminary coating being needed. Of interest where wall maintenance is a prime concern, this paint is claimed to be tougher and more resilient than plaster and more scrubbable than many paints.

Made in a concentrated form, this paint comes in a neutral shade and may be mixed with company's Satin Latex Paint for various colors. Surfaces dry in an hour, company says, and leave no unpleasant odor or toxic fumes. The

MICRO Precision Switches

MICRO tips
MICRO tips
MICRO tips
Ideas Exchange
5 SNAP-ACTION SWITCHES INCREASE SAFETY, SPEED, EFFICIENCY OF SCREW MACHINE
THIS SURFACE GRINDER WON'T OPERATE UNLESS THE MAGNETIC CHUCK IS TURNED ON
WINNING IDEAS FROM ALEX ELLENB
A SAFETY APPLICATION

HOW MUCH is a new production idea worth?

• Every month *MICRO TIPS*, a lively interesting idea forum, offers plant engineers, electricians and maintenance men new, practical ideas to production short cuts.

For years, plant operating men have been putting new life in old machines by installing MICRO precision switches to make them safer, more automatic and more productive.

These include the use of MICRO switches as limits, safeties and interlocks on almost every conceivable type of plant equipment. Special MICRO switches are available for use in explosive atmospheres or other hazardous locations.

MICRO TIPS is the place to read first hand experiences of other plant operating men. Just one new idea on how to make your equipment produce more can be invaluable. The cost? *MICRO TIPS* costs you nothing. Just send in your name and address and ask for *MICRO TIPS* today. You'll be glad you did.

MICRO switches are easy to buy. Look under "Switches, Electric" in your phone book. One of our 176 authorized distributors is as close as your phone.

Micro Switch provides a complete line of small, snap-action switches. They are available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

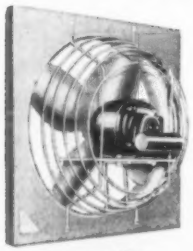
FREEPORT, ILLINOIS

HONEYWELL

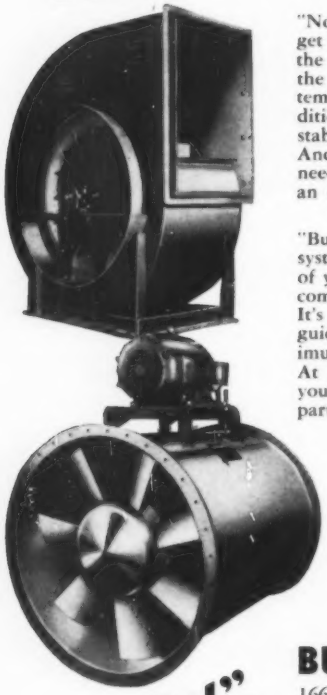
For more facts circle 575 on Reply Card

"Here's My Problem"
CUSTOMER:
First, one of our older buildings has areas which need spot ventilation. Then, in another building, we're going to need large-capacity exhaust to get rid of dust and moisture. Finally, we need additional capacity in an old system where we've just installed some air cleaning equipment. Now, my problem is . . .

Which "Buffalo" Fan Shall I Use?



BUFFALO REPRESENTATIVE: "To begin with, no single type of fan is the best solution to *all* problems. The best and cheapest answer to your spot ventilation, for instance, is the new Type "NV" Breezo Fan. An efficient propeller fan with strong rigid, die-formed square panel, the "NV" is simple to install in outside walls wherever you need to exhaust stale air. It can be operated free-air or duct-connected (¼" to ½" s.p.) equally well. The "NV" is made in sizes for 500 to 5500, cfm capacities, and if you need larger capacity, use the new "NV" Heavy-Duty Belt-Air, it's in sizes up to 90,000 cfm.



"Now, for your large-capacity exhaust system, you'll get greatest long-run satisfaction and economy with the new Type 'BL' Limit-Load centrifugal fan. It's the type recommended most frequently for large systems—straight ventilation, air washer and air conditioning supply. You can't overload it, and it gives stable performance from shut-off to free air delivery. And you can pick exactly the rated capacity you need, from 1,000 to 500,000 cfm, with no waste in an oversize fan or over-specified driving power.

"But where you need to step up the capacity of a system, mount an axial flow fan in a straight portion of your ductwork. The 'Buffalo' Axial Flow is light, compact and takes little more space than your duct. It's extremely efficient in straight runs, and has guide vanes to keep turbulence and noise at a minimum. So you see, there is no *one* fan for all jobs. At Buffalo, we make all types and sizes, so that you can pick one that's practically tailored to your particular need. We've been building fans for 77 years, too, which means that you can be sure of any 'Buffalo' fans you pick."

SUGGESTION: Most important of all, remember that Buffalo Engineering Sales Representatives are all technical graduates, factory trained for a number of years; they know fans and their application. Located in all principal cities, they are ready to assist you, too, in fan selection. Why not call on yours today?

BUFFALO FORGE COMPANY

166 Mortimer St. Buffalo, New York

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

"Buffalo"

VENTILATING • AIR CLEANING • AIR TEMPERING
INDUCED DRAFT • EXHAUSTING • FORCED DRAFT
COOLING • HEATING • PRESSURE BLOWING

For more facts circle 576 on Reply Card

NEW PRODUCTS

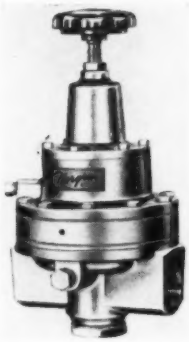
(Begins on page 120)

paint retails for about $4.30 a gallon. A 38-chip color chart and illustrated folder is offered. Luminall Paints, Div., National Chemical & Mfg. Co.

13—PRESSURE REGULATOR is pilot-controlled unit

Designed for extreme precision in air control over a wide operating range, the Series 20AC00 Regulator is said to reduce line pressures up to 400 psi to working pressures from 2 to 120 psi. It provides a pilot regulator and a pressure regulator in an integral unit.

This pilot-controlled regulator utilizes regulated air pressure to control delivered air pressure, minimizing the effect



of fluctuating line pressure as a factor in delivering uniform working air pressure. A light adjusting spring in the pilot control regulator makes regulation easy, it is explained, and balanced valve construction affords more accurate pressure control and greater air capacity. The unit is available in ½, ¾- and 1-in. sizes. A companion pressure regulator is available with a remote control unit. C. A. Norgren Co.

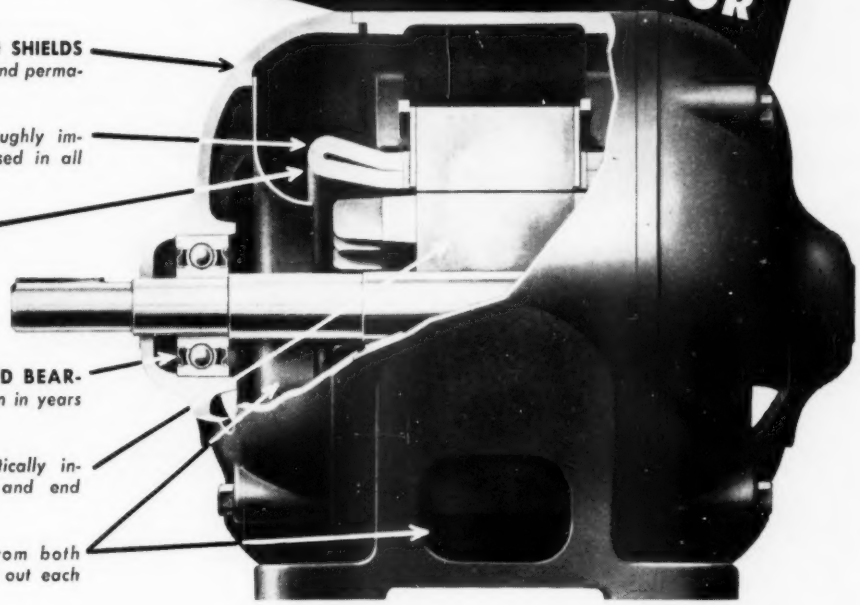
It's easy to obtain product data with the postage-free Reader Service Cards on pages 37-38 and 167-168. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

14—Y-SHAPED CONVEYOR for speeding up bag packing

An adaptation of this company's standard sewing conveyor, the Y-veyor is said to enable two men to turn out what three or four would ordinarily turn out in packing products in textile or multiwall bags. Materials handled include flour, mashes, chemical products, and other light, bulky material requiring packing or settling. The system consists of two 3-ft spiral conveyors, forming the arms of the "Y," and

Reliable?— well, check these features in the...

ELLIOTT SQUIRREL-CAGE INDUCTION MOTOR



RIGID GRAY IRON END SHIELDS *for solid bearing support and permanent alignment.*

VINYLASTIC WIRE *thoroughly impregnated and baked, used in all stators.*

CORDED END TURNS *for strength and permanence and phase-to-phase insulation to give further assurance of long life.*

SEALED PRELUBRICATED BEARINGS *needing no attention in years of service.*

ALUCAST ROTORS *practically indestructible — bars, fans and end rings are one solid piece.*

DUAL VENTILATION *from both ends of rotor, discharged out each side of the frame.*

Isn't this what you want in a good general-purpose motor —one that will require no babying nor special attention while in service on machine tool, process apparatus, fan, blower or pump? Here is sound dependability based upon solidly established past performance in applications of all kinds. Here is a motor that has passed every service test, thousands of them, tough as they come.

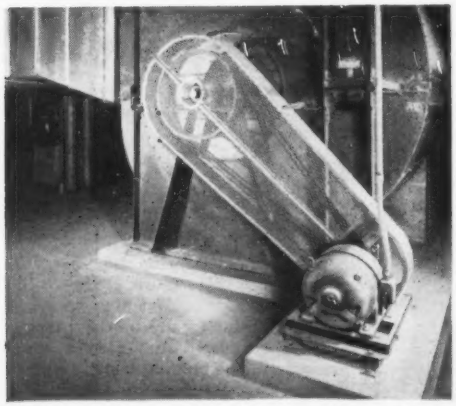
Another thing—this motor with all its rugged qualities, is available in all standard mountings—horizontal C face mounting, frame with feet — vertical flange mounting, with built-in C-W brake, in open drip-proof or splash-proof enclosure. In NEMA frames 203 through 505.

Put this Elliott Crocker-Wheeler motor wherever you want it, and say good-bye to motor troubles.

For full data on this and other Elliott C-W motors, contact your local Elliott field engineer or write Elliott Company, Jeannette, Pa.

RIGHT FOR AIR CONDITIONING

Here is one of 95 of these C-W motors in a new air-conditioned skyscraper. This one of 15 hp, drives a big return fan.



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CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

W3-2

For more facts circle 577 on Reply Card

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even better

SKF Triple-Seal
"SAF" PILLOW BLOCKS

BETTER Because SKF's Type "C" Spherical Roller Bearings . . . .

Increase capacity
25% to 50%
increase
service life
2 to 3½ times

The big news in bearings—news from SKF—is the Type "C" Spherical Roller Bearing—as a replacement for ordinary sphericals, size for size, lasts *2 to 3½ times longer, increases capacity up to 50%.*

This improved design is now available in SKF's famous Triple-Seal "SAF" Pillow Blocks.

You get this longer life and increased capacity *in addition* to—

- Effective sealing from dirt.
- Lubricant retention.
- Adapter mounting for tight fits on standard shafting.
- "Free" or "Held" design.
- Easy installation and inspection.
- Self-alignment.
- NO INCREASE IN COST!

YOUR SKF DISTRIBUTOR will give you complete details about the "C" bearing and a copy of SKF Bulletin No. 365 which contains technical data, sizes available, increased life and capacity you can expect for each size.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
—*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7521

SKF®
BEARINGS AND
PILLOW BLOCKS

For more facts circle 578 on Reply Card

NEW PRODUCTS

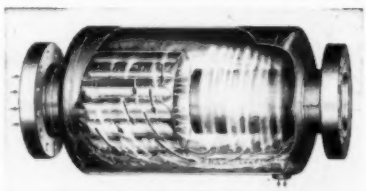
(Begins on page 120)

a 7-ft 3-in. V-belt sewing conveyor, which forms the leg of the "Y." A controlling mechanism at the receiving end of the latter is a key feature—it serves to prevent filled open-mouth bags passing from the spiral conveyors to the V-belt conveyor, from spilling.

In operation, the two spiral conveyors are placed under two packers, and the packing operator stands between them at the junction of the "Y." The sewing operator stands in front of the sewing conveyor. The time saving advantage lies in the fact that the packing operator can load one packer while the other is packing. Both sewing and packing operators work at top efficiency, it is pointed out, and maximum utilization of the sewing head and conveyor are permitted. Richardson Scale Co.

15—MOISTURE SEPARATOR for use in horizontal lines

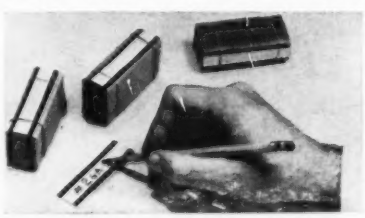
The 31-N Separator, for horizontal steam, air, and gas lines, is a refinement of manufacturer's Type 30-N. Like the latter, the new separator installs in minimum space, occupying



scarcely more space than the section of pipe it replaces. It is self-cleaning and may be used with a wide range of pressures. Construction is fabricated steel. The 31-N Separator utilizes centrifugal force for removing entrainment, including water, oil and solids from the pressure line. Wright-Austin Co.

16—WRITE-ON TAPE now comes in pre-cut labels

Labelon, a self-adhesive plastic write-on tape, previously available in roll, tablet, or book-match form, is now furnished in cut-to-size strips or labels from 1-in. to 6-in. long and 5/16-in. to 3-in. wide, and with a variety of

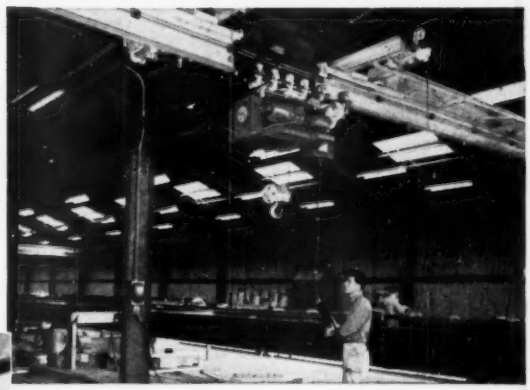


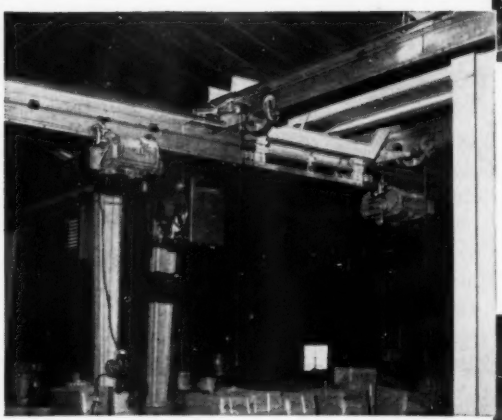
border colors. Labelon can be written on with any dry, blunt point, such as a pencil or stylus. Writing appears (in the same color as the border) beneath a layer of transparent plastic due to pressure of the writing instrument. Notations thus written are protected by

.....AMERICAN MONORAIL CRANES

for smooth operation at low maintenance cost use.....

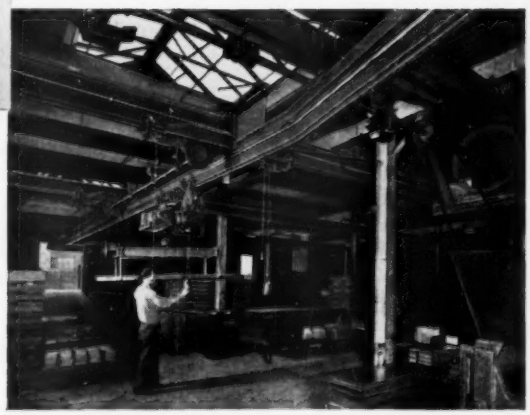
Three-ton hoist hook service extends from craneway to craneway by finger-tip controlled passage of carrier across crossover with cranes interlocked at each end.





One-ton hoist operated from crane bridge to crane bridge interlocked at crossover between craneways.

Three MonoRail cranes are interlocked to form passageway for transfer from receiving dock to steel storage area. Crane in foreground interlocks with spur track to each shear.



To handle variable loads over maximum areas, MonoRail Cranes offer smooth travel, easy movement, interlocking service between and beyond craneways, low initial cost and most important low maintenance cost. American MonoRail engineers are experienced in all phases of "up and over" handling. They are available for free consultation at your convenience.

Write for C-1 Bulletin

AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13123 ATHENS AVENUE • CLEVELAND 7, OHIO

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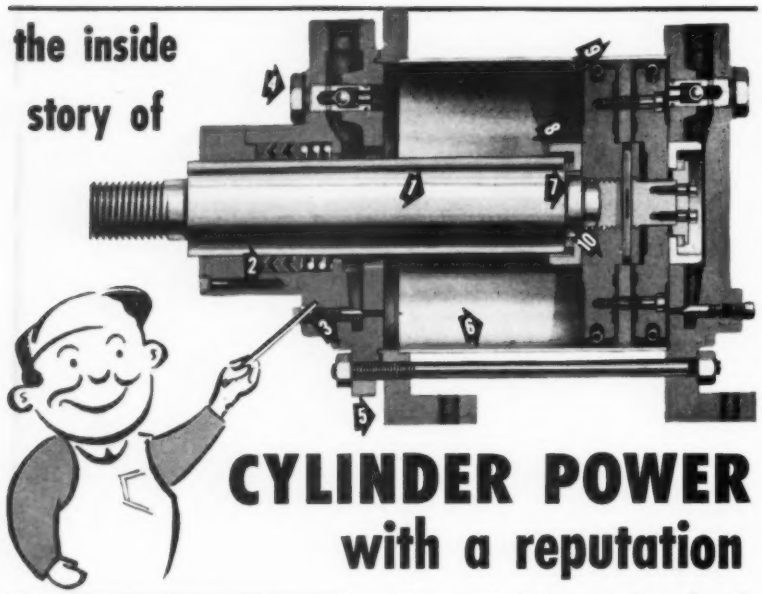
the inside story of



CYLINDER POWER with a reputation

10 HANNA FEATURES

1. Piston rod ground and polished to assure long packing life and smooth operation.
2. Spring-backed, chevron type packings permit solid fit of gland to front head. Self-adjusting.
3. Bleeder adjustment needle is stainless steel, shakeproofed to provide self-locking cushion adjustment.
4. Replaceable bronze check valve for quick starts under full power on return piston stroke.
5. Flange design permits removal of front head without disturbing cylinder mounting.
6. Brass cylinder tube is non-corrosive with smooth bore for longer packing life.
7. Cushion floater with cork washer facilitates cushion alignment with head.
8. Bronze cushion sleeves—non-corrosive, long wearing.
9. Expander springs insure uniform contact of packing with tube and eliminate collapse.
10. Piston "O" rings prevent air leakage past threaded piston fastening.

With most things you buy, brand name is important. When you buy air cylinders, it's downright vital. With cylinders, as with other products, name is built on reputation. Hanna's reputation springs from more than 50 years of research and pioneering in power motion. When you specify Hanna, you specify cylinder power with a reputation. The proof? You'll find 10 specific reasons for the superior performance of Hanna cylinders in the panel at the left.

Standard models for every application.

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HYDRAULIC AND PNEUMATIC EQUIPMENT
CYLINDERS . . .
VALVES . . .
RIVETERS . . .

For more facts circle 580 on Reply Card

NEW PRODUCTS

(Begins on page 120)

the transparent plastic outer layer, manufacturer says, and Labelon resists temperatures from —40 to 150 F, doesn't curl or discolor, and can be reapplied many times. In the new form, strips are mounted on polyethylene paper, from which they peel off cleanly. Samples offered. Labelon Tape Co., Inc.

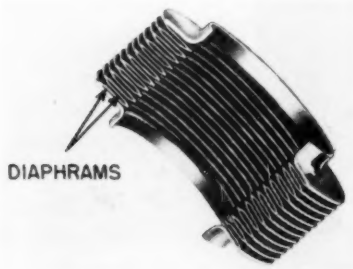
17—FAN VENTILATOR features simplified design

Mechanical improvements and complete redesigning of the Airlift, a centrifugal fan ventilator, are announced. A new one-section hood—lifting on swing-hinges in the smaller models and removable on the large sizes—covers the motor chamber and directs air exhaust downward for dispersion over roof. Removal of the hood provides access to motor and fan chambers for servicing and cleaning. Designed primarily for low noise level duct exhaust, the Airlift is catalogued in 14 sizes and a wide range of capacities at static pressures from 0 to ⅞ in. Bulletin AL-2 describes the Airlift. The Swartwout Co.

18—METALLIC BELLOWS offer heat, vibration resistance

Commercial production of welded-diaphragm metallic bellows in a variety of sizes and metals is now underway. Originally developed for atomic energy application, the special construction of this bellows is said to give it long life under severe conditions of corrosion, vibration and high temperature. It is reported to be finding wide application as a shaft seal, expansion joint and vibration absorber.

According to company engineers, failures in many metal bellows occur at the bend in each convolution, due to concentration of flexing at this point



during expansion and contraction of the bellows. Welded diaphragm construction, it is noted, distributes the flexing over entire height of convolution, thus avoiding concentration of flexing.

Two other advantages are also attributed to this construction: 1. Flexibility can be increased by increasing the height of the bellows convolutions. This permits producing a bellows with the great flexibility required for lines conveying gases or liquids at low pressure, it is explained; and, at the same

Improve Your Combustion Control with ROCKWELL "120" GAS PRESSURE REGULATORS

Get Better Performance and Economy From All These:

- INDUSTRIAL FURNACES
- OVENS AND KILNS
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No matter what you are processing with gas, the quality of your end product depends upon the degree of combustion control you can maintain. With Rockwell "120" regulators it's no problem to hold an even, constant pressure at the burners. They have a large area diaphragm and friction free control movement to assure maximum sensitivity and long life. By making slight alterations to standard construction the Rockwell "120" can be used as a back pressure regulator, a pressure relief valve, a non-return valve, a flow controller, a shut-off valve or a proportioning control.

In many applications remote control can be applied to permit the regulator to anticipate pending changes in flow rate or pressure.

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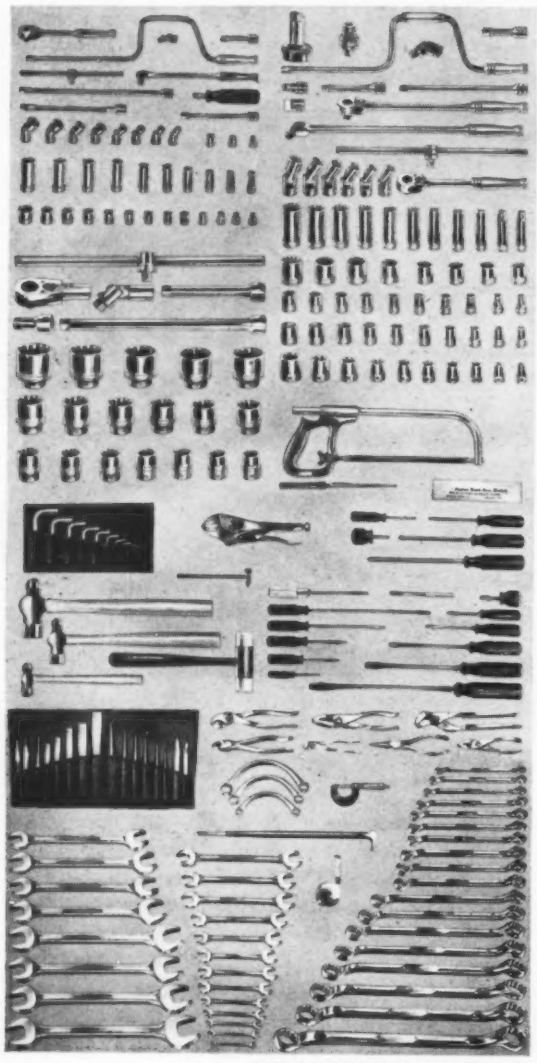

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SERVES INDUSTRY EVERYWHERE THROUGH THESE 43 FACTORY BRANCH WAREHOUSES

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This complete industrial tool set is planned for fastest, most efficient machinery maintenance and repair. Wrenches include every standard size from ¼" to 2⅜", in types to speed every maintenance operation. Available in carry-chests or roll-cabs which transport complete set from crib to job—eliminates time wasting "tool trips"—increases the efficiency of your maintenance department. Phone the nearest Snap-on factory branch listed here. For free catalog of 4000 Snap-on hand and bench tools, write

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THE CHOICE OF BETTER MECHANICS

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NEW PRODUCTS

(Begins on page 120)

time, this flexibility can be attained with metal sufficiently thick that bellows for low pressure lines can withstand high external pressures. 2. The increase of flexibility with height of convolution also permits greater expansion range for the bellows length.

Two types of bellows with this new construction are offered. The "standard" type consists of a series of male expansion elements, and the "nesting" type comprising a series of nesting male-and-female expansion elements for extreme flexibility. Titeflex, Inc.

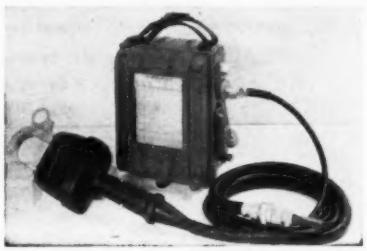
19—LIGHTWEIGHT HOSE for heavy-duty vacuum jobs

Flex-Vac is a new lightweight, wire-reinforced thermoplastic hose especially designed for heavy-duty vacuuming applications. The new smooth-bore hose is said to be extremely flexible and abrasion resistant and to offer good visibility from afar as a plant safety feature. Flexible Tubing Corp.

20—VOLT-AMMETER is hook-on recording type unit

This portable recording instrument, the Type CF-7, has been developed for obtaining a permanent record of alternating current and voltages. It is said to combine the features of a self-latching multi-range hook-on current transformer with the simplicity of company's inkless recorder (Type CF) in equipment suitable for indoor and outdoor applications. It is expected to be particularly useful for checking loads on distribution lines, verifying motor loads, detecting overload circuits.

The equipment consists of a hook-on current transformer, a connecting lead, and an inkless recording volt-ammeter,



all interchangeable. According to manufacturer, alternating current can be measured and recorded on both insulated and non-insulated conductors in circuits operating at potentials up to 8700 v—by hooking the current transformer around the lines and connecting the recorder to a 120/240-v a-c source. Featuring a self-supporting hook suitable for all conductors up to 2 in. dia, the transformer provides current ranges from 15 to 750 amp, selected by a range-changing switch on the instrument.

Company engineers point out that no auxiliary equipment is needed to measure wide-range a-c voltages since the

LIGHTED STORAGE AREAS frequently can be used in place of costly indoor storage space when the material will not be harmed by weather. G-E floodlighting helps safeguard material and makes it more accessible for operations at night.

LIGHTED PLANT ROADS are safer, let traffic move efficiently during dark periods of the regular work shift. G-E floodlighting permits movement of raw materials to production areas at night when roadways are not congested with traffic.

G-E OUTDOOR FLOODLIGHTING

can expand the use of your plant work areas

LIGHTED PLANT YARDS are better protected against pilfering and trespassing, and help reduce costly employee accidents. G-E floodlighting of plant boundaries often reduces the number of guards and watchmen needed for plant protection.

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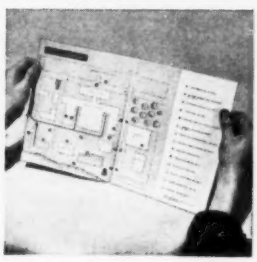
This bulletin has been designed to show you how to light your industrial work areas. G.E. also maintains a staff of trained lighting specialists who will be glad to help you with your lighting problems. Just contact your local G-E Floodlighting Distributor or send for this bulletin.



General Electric Company, Apparatus Dept.
Section B451-190, Schenectady 5, New York

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IMPROVED OPERATION OF LITERALLY HUNDREDS OF MECHANICAL PRODUCTS HAS BEEN EFFECTED WITH ACCO TRU-LAY FLEXIBLE *PUSH*-PULL CONTROLS

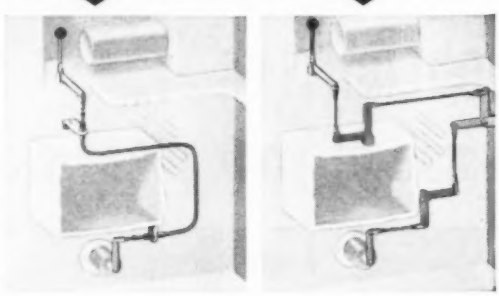
If you would like more information, after reading this brief summary of the characteristics and widespread use of this versatile Remote Control, just ask us to send you our **IDEA FILE** with complete Application Data.

Tru-Lay Push-Pull Controls provide POSITIVE REMOTE-ACTION over long or short distances . . . with fixed or movable anchorages . . . for light loads or loads up to 1,000 lbs., and these units are frequently and successfully used in conjunction with Electrical, Hydraulic and Air Controls.

• • • • •

Flexibility makes it possible to snake around obstructions . . . simplifies installation . . . reduces the number of working parts . . .

to give you this simple and effective assembly ⬇ **. . . rather than this complex (and expensive) series of linkages** ⬇



POSITIVE REMOTE-ACTION and FLEXIBILITY together with Precision and Long Life, explain why TRU-LAY PUSH-PULLS serve designers and users equally well in improving machine operations, whether the application is on such severe service jobs as Bulldozers, Power Shovels and Steel Mill Machinery, or on such light duty work as Photographic Equipment, X-Ray or Business Machines.

Immunity to Vibration makes these TRU-LAY PUSH-PULLS ideal as Remote Controls on shakers and other vibratory products.

Complete Protection Against Dirt and Moisture is a big factor in the use of this unit on machinery in Coal Mines, Cement and Steel Mills, Oil Fields and in many other industries.

Corrosion-Resistance of the unit, plated or with Stainless Steel construction as required by the use, has led to many applications in the Marine Field . . . salt water or fresh. Supplied with a rubber cover the unit operates effectively even when conduit is COMPLETELY IMMERSED.

Lubrication of the inner working member is taken care of for life.

Temperatures as low as −70° F. will not hinder the proper operation of this unit, and it is thoroughly effective even in the extreme high temperatures encountered on Jet Engine, Furnace Door and Glass Furnace Damper control applications.

It is more than likely that you will find ACCO TRU-LAY *Flexible* PUSH-PULL CONTROLS doing a good job on some or many of the products used in your own business . . . on your drinking fountains, business machines, factory lift trucks (gas or electric) to control tilt and lift, or in your power or heating plant, perhaps controlling the pitch of blades on a big exhaust fan. The full list of applications is simply tremendous.

Send for this IDEA FILE *This* **IDEA FILE** *will answer most of the questions you may have in mind as to how you might make additional applications of this versatile and dependable tool. Write for a copy, without obligation.*

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For more facts circle 584 on Reply Card

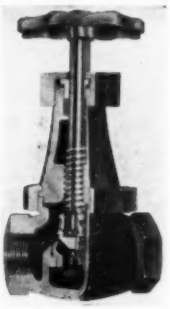
NEW PRODUCTS

(Begins on page 120)

recorder itself measures voltages in three ranges (0 to 150/300/750 v) by means of the range-changing switch. Amperage ranges are 15/75/150/750 amp. Frequency is 50 or 60 cycles. General Electric Co.

21—GLOBE VALVE designed to achieve firmer seat

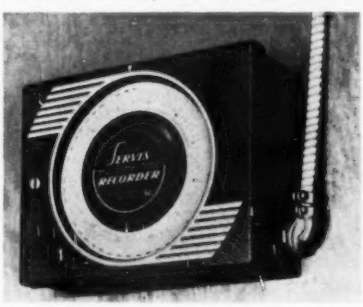
The Gyroseal Valve is an improved version of this company's Ostlind Valve. According to manufacturer, it eliminates causes of valve failure by causing the disc to rotate rapidly at the moment of closure. Foreign particles are thrown off by centrifugal force and the turbulence created keeps the particles in suspension while the disc is gently polished against the valve seat.



Gyroseal Valves are described as stronger yet simpler in construction than the original valves having this feature, and to last longer, need less repair and be simple to repack. They are said to cut downtime by eliminating such as leakage, unbalanced flow, wire drawing, sticking, and regrinding or replacing disc and seat. Richmond Foundry and Mfg. Co.

22—RECORDER shows how busy the machines are

The Model M is designed to provide an immediately visible record of the busy and idle time of plant machinery. Besides its use in improving machine productivity, this recorder aids in time studies to set rates, or as a check on the exactness of processing operations. Requiring only a wire connection to the machine's motor, this recorder can be located anywhere, it is stated, and the recording can be seen as the machine operates—a sapphire stylus does the marking on a wax-covered chart. And to prevent unauthorized opening of the instrument, the chart shows when the case is locked or unlocked.



A standard 6-in. dia, 24-hr chart will revolve three times, making a total rec-

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Actually there is only one source for all of the types of wire and cable you may need...that's General Cable. To meet your every requirement, General Cable manufactures bare, weatherproof and insulated conductors of every variety ...maintains vast stocks...the broadest distribution facilities in the industry...ultra-modern plants coast to coast. Specify "General Cable." Don't settle for less.

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Work-O-Matic® End-Loading Scoop for lift trucks.
Greater storage with compactly tiered Steel Boxes.
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INDUSTRY'S BROADEST LINE OF
Material Handling Containers
Work-O-Matic® Multi-Duty Tray for long pieces. Collects, transfers, tiers and dumps.
Skid Platform . . . one of many types.
Typical Steel Skid Box.
Double-Deck Pallet.
Work-O-Matic® Box with Production Positioning Stand.
Nesting and Hopper Front Steel Shop Boxes—two of many standard types.
Vu-O-Matic Rotary Parts Storage Stands.

A broad line is one thing. Far more important is the fact that Union Metal units introduce exclusive *new method* features responsible for huge cost savings in plant after plant. Get up-to-the-minute facts. Indicate the type units you are interested in and write to The Union Metal Manufacturing Company, Canton 5, Ohio.

*Patent No. 2,445,038. Other patents pending.

UNION METAL

Material Handling Equipment

For more facts circle 586 on Reply Card

NEW PRODUCTS

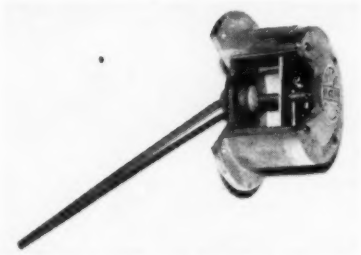
(Begins on page 120)

ord of three days and three nights. Twelve-hr and 8-hr charts are also available. If desired, an elapsed timer or counter is included. A folder gives data. The Service Recorder Co.

To receive product data circle item numbers on the handy Reader Service Cards on pages 37-38 and 167-168.

23—LEVEL CONTROL for use with dry materials

Scrayco Level Control, for dry materials, operates on a principle exactly the reverse of the ball float of the ordinary toilet, it is explained—the shutoff device going down, instead of up. Here's how it works: A compact, sealed housing is bolted on the outside of a storage bin (or chute or duct). This housing contains a switch, connected with a spring which, in turn,



is hooked to a rod running through a rubber sphere on the side of the housing next to the bin wall.

The sphere, of natural or synthetic rubber as required, is enclosed in a housing that separates switch housing and bin interior. The rod running through the flexible sphere bends downward inside the bin, and may be angled to any degree from horizontal except to absolute vertical. This rod (the sensing probe) is the part that comes in contact with the flowing material and, moving freely through the flexible sphere, works the spring to throw the switch that cuts off the flow at the desired level. When the probe goes downward, due to the weight of the materials reaching it, the electrical contact breaks and the flow ceases.

Among advantages stressed by manufacturer of this control is adaptability to a wide range of dry materials from light to heavy and fine to coarse. Also, it is pointed out, the controls in the housing are sealed off from the flow of materials by the rubber sphere. Scrayco.

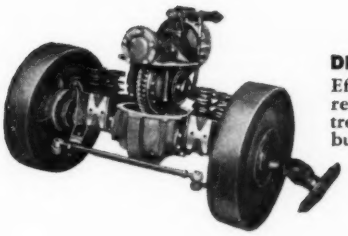
24—NAIL PULLER speeds opening of crates, boxes

The Allenco Nail Puller is a pneumatically operated automatic tool intended to save labor, space, and ma-

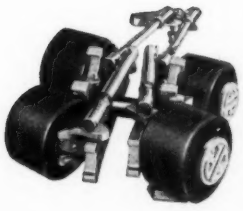
each of 16 ELWELL-PARKER ten-year-olds averages only 1 hour per month maintenance!

The fleet of Elwell-Parkers at Jack & Heintz, Inc. frequently operates on a 24-hour-per-day-basis. Since no high tiering is involved, *low lift platform* trucks are used. They are lighter than comparable fork models. Floor maintenance is thus reduced. Their short length and short turning radius (all wheels steer) make them extra maneuverable in close quarters.

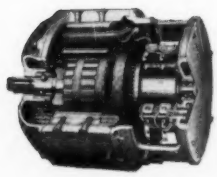
some plus values of E-P trucks that explain this remarkable record:



DRIVE AXLES
Efficient, silent worm reduction units of heat-treated alloys. Ruggedly built and easily serviced.



TRAIL AXLES
Fully articulating steering axles assure longer tire life. Dust-proofed, anti-friction bearings in steering rods and wheels reduce maintenance—make steering easy.



MOTORS—E-P BUILT
Practically indestructible and fireproof. Armature coil-commutator connections are *brazed,* not soldered. Double brushes mean more current capacity and less wear.

"ROLOTAC" CONTROLLER
Provides exact truck control, because trigger snap and sliding action assure instant make or break — eliminate arcing. All contact fingers and their parts are interchangeable.

LIFT JACK—A simple mechanism—3 moving parts—worm, worm wheel, and ram, protected by overload slip clutch.

get all the facts Send for General Catalog that describes 150 models. Write The Elwell-Parker Electric Co., 4175 St. Clair Ave., Cleveland 3, Ohio.

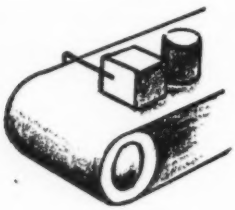
ELWELL-PARKER
POWER INDUSTRIAL TRUCKS
Established 1893

For more facts circle 587 on Reply Card

is OIL EATING your conveyor belting?

MAIN OIL BUFF conveyor belts are not affected by petroleum of any kind and resist attack by most vegetable oils. These performance-proved belts are ideal for production line assembly work—especially where oily materials are conveyed.

is ABRASION CHEWING your conveyor belting?



MAIN OIL BUFF conveyor belts are highly resistant to abrasion . . . recommended for conveying metal tote pans, wooden boxes and crates, rough machine parts, oily metal stampings and for use on conveyors using diverter arms.

USE Main OIL BUFF

COMPLETELY OIL RESISTANT— ABRASION RESISTANT

Out-performs on BOTH counts

MAIN OIL BUFF conveyor belts are thoroughly impregnated with a special oil formulation. You profit with longer, more dependable conveying service where other belts fail.

Main Oil Buff conveyor belts are made in three canvas duck weights: 32 oz. for light duty, 37½ for heavy conveying, and 39 oz. for extra heavy loads or long belts where minimum stretch is a prime consideration . . . width and thickness to meet your specifications.

It will pay you to investigate Main Oil Buff—the oil resistant belt. Write for the name of the Main distributor nearest your plant.

Copies of the latest bulletin on the Main line of conveyor belting are available upon request.

Main BELTING COMPANY
1241 Carpenter Street
Philadelphia 47, Pa.

For more facts circle 583 on Reply Card

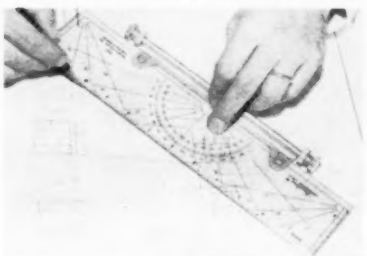
NEW PRODUCTS

(Begins on page 120)

terial. It is designed to concentrate power at the target point only—to deliver more power without straining lumber or contents. It seizes the nail shaft, not the head, and grips it firmly, manufacturer explains, and it provides a reliable perpendicular pull. The tool uses 75 to 100 lb of air pressure, weighs 10 lb. Included with it is a 12½-ft length of air hose with instant action connections and automatic shut-off. A portable compressor, regulator and filter are available. The nail puller comes in the Model 14 for pulling 6-to-14-penny nails, and the Model 20 for pulling 10-to-20-penny nails. Both sell for $195.00. W. D. Allen Mfg. Co.

25—DRAFTING DEVICE is versatile, pocket-sized

The Paraline is designed to combine the functions of T-square, triangles, straight-edge, scales and protractor, or drafting machine, in one simple unit without adjustments or extra parts. It weighs less than 4 oz. Manufacturer says it may be used on any flat surface for ordinary drawings, or to speed up detail work on large drawings where



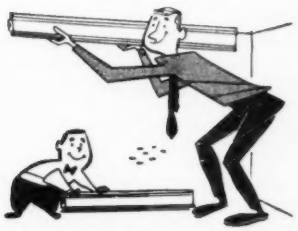
drafting machine or T-square are used on the drawing board. Angles and tangents are projected by aligning the transparent protractor along the base line and rolling the instrument until the straight edge intersects the base line at the point at which the angle is to be drawn. The Paraline is said to be extremely rapid in cross-hatching.

A professional model of the device is 12½ in. by 3½ in. in size and available with either architect's or engineer's scales. It costs about $5.50. A smaller model, with architect's scale, costs less than $4.00. Pickett & Eckel, Inc.

26—WHEEL HONING CHIP for barrel finishing work

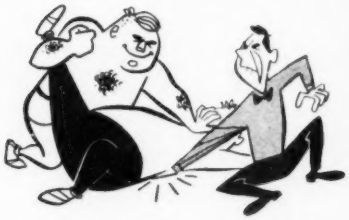
Novaculite offers several advantages as a precision barrel finishing chip, according to manufacturer, it has a long service life; it reaches hard-to-get indentations without wedging or clogging holes; and it doesn't charge the work. Also, these chips are said to produce a fine finish to close tolerances with uniform radii on all edges of the work.

Novaculite Chips have a conchoidal shape, irregularly formed with sharp edges and elongated points, manufacturer explains, and this means that a

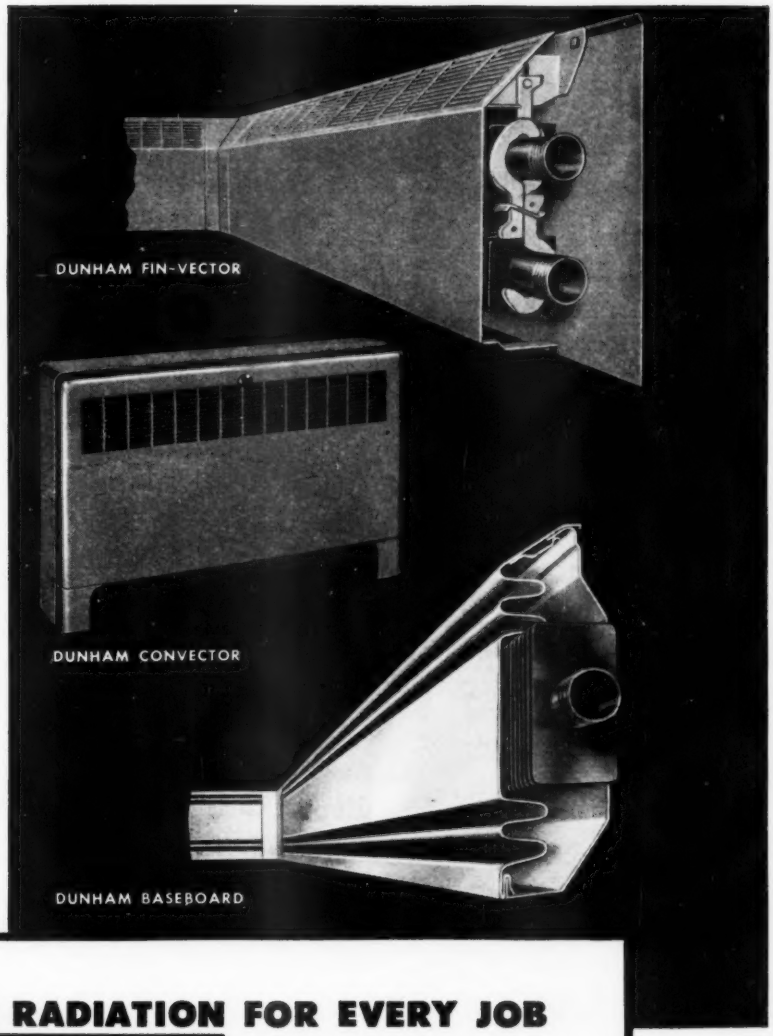


"Light weight—can be suspended at *any level* along wall"

"Easy-to-turn damper knob in reinforced, one-piece front"



"Fits flush with the floor—no 'cleaning under' problem"



EVERYTHING IN RADIATION FOR EVERY JOB ...FROM THE COMPLETE DUNHAM LINE

Here's As Complete A Line of radiation as you can get . . . *anywhere.* Good-looking Dunham Baseboard, along the wall Fin-Vector Radiation, and fast-heating Convectors have both new and improved features that can save you time and trouble now, and insure customer satisfaction years from now.

So why bother to shop around getting one type of radiation here . . . another type there? Why not put all responsibility for heating performance squarely up to one manufacturer. Let Dunham do it . . . and you'll have no regrets whether you specify, install or live with Dunham Radiation.

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Chicago 6, Illinois

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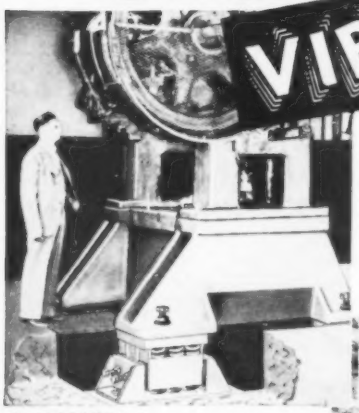
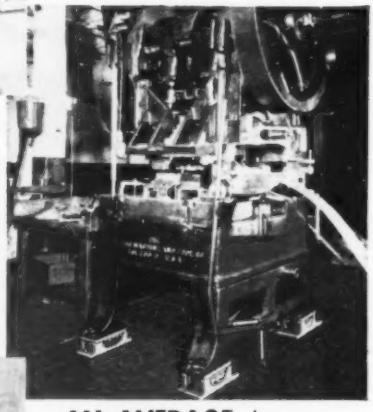
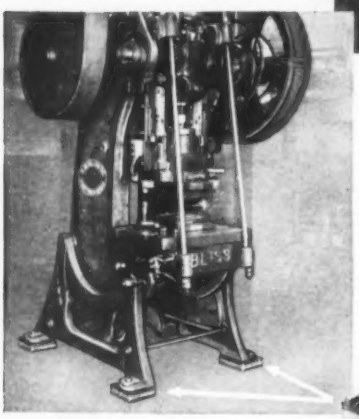
STOP VIBRATION with KORFUND VIBRATION CONTROL

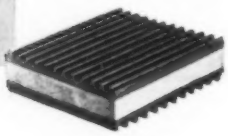




A TOUGH PROBLEM solved by specially designed Korfund Steel Spring Vibro-Isolators. Shock from this 100,000#-600 ton capacity press was cracking building walls. Four specially designed 25,000# capacity Korfund Steel Spring Vibro-Isolators, themselves weighing 600# each, were installed under the press. Building damage stopped and heavy production schedules were maintained. Yet, the price of the special Korfund Isolators was less than 3% of the press cost.



AN AVERAGE PROBLEM—typical of those solved every day by Standard Korfund Steel Spring Vibro-Isolators. Vibration and noise from this double crank press, which could be felt and heard throughout the building, were stopped by Standard Korfund Steel Spring Vibro-Isolators. More and more manufacturers are discovering how Korfund Vibro-Isolators permit press installation without reinforcement of floors, permit press installation *anywhere* (even near precision equipment) for better plant layout, increase press speed and production, improve quality.



A SIMPLE PROBLEM solved inexpensively and *effectively* by Korfund Elasto-Rib Pads. In this case, Elasto-Rib Pads installed under each of the legs of this press stopped transmission of vibration and noise. For the less critical installation, Korfund Elasto-Rib Pads provide low-cost, *effective* vibration and noise control, and eliminate bolting to the floor.

PUNCH PRESSES are notorious for the amount of vibration and noise they transmit—yet in the three cases illustrated, Korfund Vibration Control units successfully solved the problem. In our files are scores of case histories describing equally satisfactory installations on many other types of machinery.

A selector chart is available giving recommendations for various vibration control problems. Write for your copy of Bulletin No. 13, or see our catalog in Sweet's Files.

For specific recommendations, contact us or the Korfund representative you'll find in most principal cities. A half-century of experience is at your disposal.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

THE KORFUND CO., INC.

48-35R Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

For more facts circle 590 on Reply Card

NEW PRODUCTS

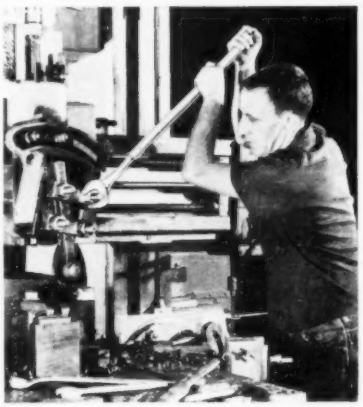
(Begins on page 120)

larger chip can get at hard-to-reach cavities. They are said to produce a mild honing abrasive action for a smooth even finish without dents, burrs or damage to stamped or cast parts. Also, because Novaculite Chips do not charge the work with abrasives or extraneous materials, they are said to offer particular advantages for finishing parts to be used in electronic assemblies or parts that would be subsequently used for plating. Literature and samples are available. Chicago Wheel and Mfg. Co.

27—OPEN END WRENCHES for heavy-duty service

A newly announced line of heavy duty open end wrenches used with detachable tubular handles covers ten models with a size range of $\frac{7}{8}$ to $1\frac{1}{2}$ in. Three different length handles, which fit two or more sizes of wrenches, are all that are needed to operate the series.

These wrenches are designed for heavy nut turning particularly on jobs where box type wrenches cannot be used or



are inconvenient. On many applications, a wrench can be used to "run-down" a nut quickly—and only then is the tubular handle attached to give increased leverage for final tightening. The wrenches have a spring mounted locking button which fits into a hole in the tubular handle to lock them together. As this button must be depressed with a nail or similar object, they cannot be separated accidentally, manufacturer points out, and there is no danger of the wrench slipping out and falling into machinery. Heads of the wrenches are set at a 15-deg angle to the handle, so that nuts can be turned with only a 30-deg handle movement. Snap-on Tools Corp.

28—TIME DELAY RELAY is compact, hermetically sealed

This compact and lightweight, hermetically sealed time delay relay, the Type SF Agastat, was originally developed for use in aircraft, but is expected to find applications in industrial control devices which must operate in wet, cor-

For Immediate Deposit!

Buell Engineers have made an *exact* science of the recovery of valuable industrial dusts. With the help of Buell equipment, many of America's Leading Corporations make substantial cash savings every day.

Buell's specialized knowledge and experience make possible a scientifically accurate forecast of efficiency and economy before you spend a single penny. You see, Buell specialists study dust content and operating conditions and submit a written report on effectiveness in advance.

We are always glad to supply the names of present users of Buell equipment right in your own field. Their year 'round experience is our best selling point!

Send for our informative Brochure—The Collection and Recovery of Industrial Dusts. It explains *all three* Buell systems of industrial dust collection. Write Dept. 14B today for your complimentary copy. Buell Engineering Company, 70 Pine Street, New York 5, N. Y.

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20 Years of Engineered Efficiency in
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CHICAGO TRAMRAIL CRANES

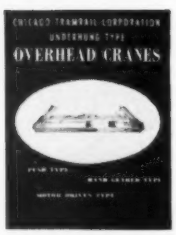
Representative installations of

underhung and top running OVERHEAD CRANES

Designed to solve your Material Handling needs . . .

Designers, engineers and builders of a wide and diversified line of overhead cranes, monorails, jib cranes and staker cranes, the Chicago Tramrail organization has an extensive, practical knowledge in materials handling problems.

Manufacturing both underhung and top running overhead cranes with capacities to 10 tons and spans to 60 feet, our Engineering Department works closely with your organization to select the exact crane which best meets your requirements, and to design and erect runways which will speed the flow of work.



ASK FOR Descriptive Catalog and Engineering Data

CHICAGO TRAMRAIL CORPORATION

4004 WEST WASHINGTON BOULEVARD • CHICAGO 24, ILLINOIS

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NEW PRODUCTS

(Begins on page 120)

rosive, dusty or explosive atmospheres. It is said to be unaffected by freezing temperatures, and to resist vibration, shock and acceleration.

Solenoid-operated and pneumatically controlled, this relay is housed in an enclosure only 2⅛ in. square and 4 in. high. It weighs only 1.2 lb. Time delay is adjustable from outside the housing over a range from approximately 30 milleseconds to more than 1 min. The relay is designed for applications where its solenoid coil will be energized only momentarily. Time delay begins upon de-energization of the coil. It is currently manufactured for 24 to 28 v d-c, with double-break contacts in single-, double-, and three-pole models. Elastic Stop Nut Corp. of America.

29—DUST COLLECTOR for smaller volume uses

The CN Cloth Bag Collector is a unit-type model announced for economical and efficient dust collection for smaller volume requirements. Self-contained and shipped assembled, it is designed for indoor use. With it, cleaned air can frequently be discharged inside the plant, manufacturer points out, a worthwhile saving where air is heated or cooled. Finely divided dusts such as carbon black, cork, fine wood, soap and metal oxides, are collected through cloth filter bags similar to those in company's larger dust collector.

Dust laden air enters the collector unit where it is expanded in a settling chamber. Here, the reduction in velocity drops coarser dust particles directly into the hopper. A baffle plate is used to keep air from rising immediately to the cloth bags, and therefore its only escape is through the open bottom of the bags. The fine dust particles are filtered on the bags' inner surfaces, the cleaned air passing through the bags and being discharged from the collector. Air flow through the collector can be shut off when necessary, and the bags mechanically shaken to remove dust from their inner surfaces. Seven sizes are available, ranging from 200 to 1000 sq ft of cloth area. Pangborn Corp.

30—STEAM TRAPS with two-step leverage design

Duo-Step leverage, formerly a feature of this company's larger sized steam traps, is now available in low priced models designed for pressures to 200 psi and temperatures to 400 F. Working on the double fulcrum principle, Duo-Step leverage is credited with virtually doubling the drainage capacity of an inverted bucket trap of a given size. The first "step" or fulcrum serves to provide the power to "crack" the ball valve from the orifice while the second completes the travel of the valve so the orifice is opened to its fullest extent. This leverage permits a larger orifice to be used without lengthening the

HALL INDUSTRIAL WATER REPORT

Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.

Volume 2 | FEBRUARY 1954 | Number 1

Amine Film Reduces Condensate Corrosion by More Than 90%

In a plant manufacturing electrical equipment, carbon dioxide and oxygen in the steam condensate were causing numerous piping failures. Corrosion products plugged lines and caused poor space heating by depositing in the heaters and by interfering with trap operation.

The Hall field service engineer recommended that the film-forming corrosion inhibitor Hagafilm* be fed to the boilers for distribution throughout the return system.

Treatment was started during the cold season and by spring all old deposits were cleaned out of the lines and failures were negligible. Test specimens showed a corrosion reduction of 91 and 92 percent at two locations. Week-end overtime work on the return system was eliminated. Trap maintenance was reduced to practically nothing whereas formerly a man had to be kept constantly on that job. Complaints, which had been commonplace before, disappeared as space heating improved. Substantial savings in equipment and manpower were achieved at moderate cost.

The next year, at the end of the first full cold season with treatment, it was reported that considerably less coal was used than during the previous year. There had been no other changes in operation and the weather was comparable.

During the second full cold season over two years after the start of treatment, the plant reported the only failures were two nipples and one tee which had been installed before the start of inhibitor treatment.

*Hagafilm is a registered trademark.

Water is your industry's most important raw material. Use it wisely.

Hall Engineer "Sees Through" Glass Problem

In this glass factory, maintenance costs were running as high as $75,000 annually. Critical were watercooled "gathering rams," the working ends of which were almost continuously exposed to furnace temperatures of 2,800° to 3,000° F. Deposits and corrosion in the cooling passages had led to overheating and failure.

An investigation by the Hall field service engineer revealed that cooling water flow through the rams was mechanically restricted in places, and that the water feed and discharge lines were poorly arranged and insulated.

Once these defects were corrected, Threshold treatment of cooling water with a few ppm of glassy phosphate proved effective in controlling deposition and corrosion. Now the plant engineer says, "We have forgotten about cooling water altogether."

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., Hagan Building, P.O. Box 1346, Pittsburgh 30, Pa.

Hall Field Engineers "Refreshed" in Pittsburgh

Hall field engineers recently spent a week in Pittsburgh attending an annual refresher course. Twenty sessions were devoted to discussions of the latest technological advances in the field of water conditioning and the engineering solution of specific water problems.

A major purpose of the course was to provide an exchange of information regarding actual situations encountered by Hall field engineers in many different types of industrial plants.

Conductivity Tests Streamlined With New Flow Cell

Hall research engineers have simplified testing for dissolved solids in an eastern utility plant's condensate and feedwater system by development of a new flow cell used in conjunction with an electrical conductivity meter. The compact unit is less than 10" long, and the cell itself is so small that there is practically no holdup to level out differences in conductivity.

One of the advantages evident in use is the ease of removal and installation of the conductivity cell when cleaning or inspection is required. The operator takes the assembly apart quickly and easily because of a specially designed flexible coupling with rubber "O" rings and back-off nuts. A bimetallic dial-reading thermometer is a standard part of the assembly. Aside from the glass cell itself, the principal "wet" components are made of stainless steel.

To meet a human need...

We believe that the hands of America's workers are industry's most important tools. For this reason we are proud to introduce the **Scott Industrial Wiper***, which is successfully meeting the wide range of wiping needs in industry. It is a general-purpose, disposable wiper designed to handle your jobs safely, efficiently and economically. A Scott man stands ready to demonstrate this product in your plant.

*PAT. PEND.

SCOTT PAPER COMPANY CHESTER, PENNSYLVANIA

For more facts circle 594 on Reply Card

NEW PRODUCTS

(Begins on page 120)

lever or increasing the size of the trap, it is said, and it works automatically.

According to manufacturer, the introduction of Duo-Step in the lower priced models will enable many trap users to replace present installations with less expensive traps that can handle as much, if not more, condensate. The Clark Mfg. Co.

31—PLATFORM TRUCK is a 2-ton capacity high lift

A 4000-lb capacity high lift platform motorized hand truck has been added to this company's line of Worksavers. Available with platform lengths up to 60 in., this highly maneuverable truck is designed to lift a loaded platform 120 in. above floor level. Two widely spaced heavy duty caster wheels serve to provide side-to-side stability for the high lift operation. Features claimed for this model include compact size, light weight, and easy operation. It is said to be especially adapted for stacking skids. The Yale & Towne Mfg. Co.

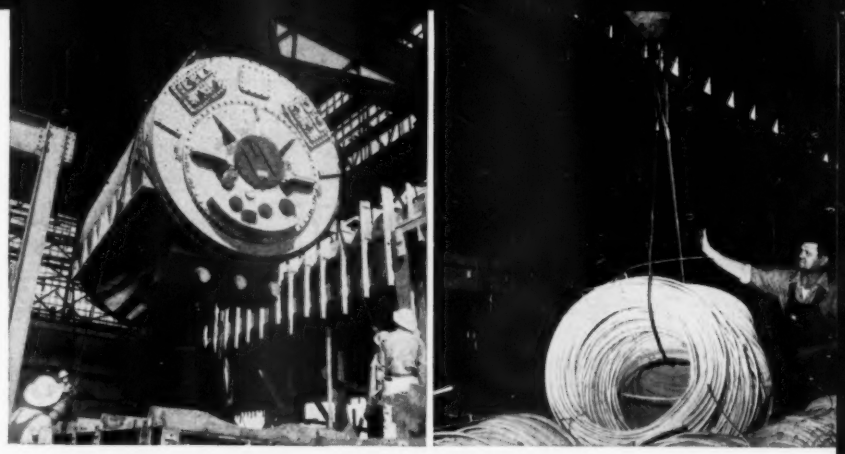
One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

32—COLOR CODING PLAN for efficient lubrication

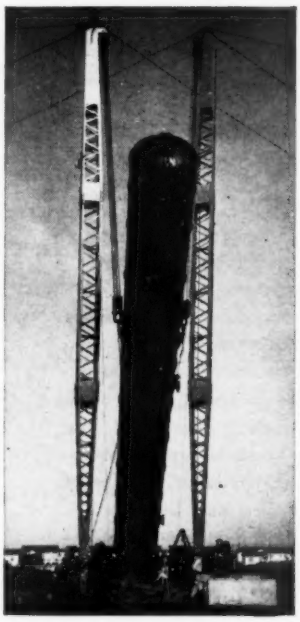
The Coloroute Plan is a method of controlling every phase of industrial lubrication. In it, color symbols are utilized to control selection, handling and application of oils and greases from "barrel to bearings." The plan makes it easy to identify and segregate lubricants in the oil room and to prevent misapplication of lubricants. It also serves to assign lubrication responsibilities, it is noted, to reduce the number of lubricants, to highlight hidden lubrication points, and to simplify the oiler's job.

The plan starts in the oil room where each lubricant drum is color coded. Application units are color coded to coincide. As each machine bearing in the plant is similarly color coded, delays in selection and mis-application of lubricants are avoided. Also, the plan incorporates a record of lubrication requirements and a schedule.

To do the job, this company offers a Coloroute Kit containing six colors of quick-drying lacquer in spray containers, a set of stencils representing varying frequencies of applications, lubrication analysis sheets, master record cards and an oil room identification chart. In the oil room the oiler transfers lubricant from the color-marked drum to the lubricant gun marked with the same color. Then he uses that gun to lubricate bearings marked with that color. Alemite Div., Stewart-Warner Corp.



Multiple-part Red-Strand Slings handle heaviest loads, and are easy to apply to both the load and the crane hook. User tests in Detroit proved Red-Strand slings withstood unusual abuse, yet maintained higher-than-rated strength. A Gary plant uses Red-Strand single-part slings for many lifting jobs like this. These slings are available with various combinations of end fittings for attaching the sling to rings or lugs.



A heavy cylindrical load usually calls for multiple-part Red-Strand Flat-Laced slings. They are strong, flexible and do not slip or abrade.

How to Select the Correct Sling for Your Job

Start your sling selection by analyzing five factors:

1. The load—its size, weight, shape, finish.
2. Working area, amount of head room.
3. Size and type of crane hook.
4. Angle of sling legs.
5. Location and type of lugs or rings, if any.

From this information your supplier can recommend the sling by type, size and length that is safest, longest lasting and most economical for your job.

Types of Slings

Multiple-part slings are always recommended for heavy duty service, because for equal strength they are far more flexible than single-part slings. They hug the shape of the load easily, present a greater bearing surface to the load, and reduce the possibility of marring surfaces.

Where these factors are not so important, either Red-Strand *single-part slings* or *grommet slings* may be used for economy. Single-part Red-Strand slings are often recommended for lifting lighter weight objects, or those that have fixed attaching rings or lugs. Grommet, or continuous strand Red-Strand slings are ideal for forming hitches of various types without fittings.

When you re-use Pin-Lock thimbles you reduce sling costs by 21%

Extra Savings

Two suggestions will help you save money on slings.

The first is to re-use Pin-Lock thimbles on multiple part slings. These exclusive Leschen Pin-Lock thimbles cut sling costs on an average of 21% because they may be used again and again. They lock into sling loops with pins instead of permanent clamps, permitting re-use, and eliminating constant expense of thimble replacements.

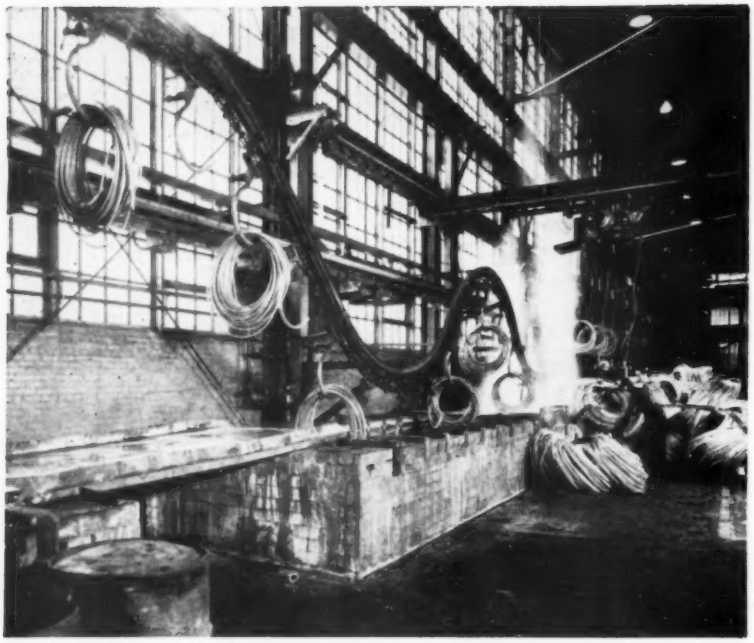
The second suggestion is to use Red-Strand slings because they are made of *higher-than-rated* quality Leschen wire rope that delivers *longer-than-expected* service.

Get a copy of Leschen's *Sling Handbook* for complete information. Ask your Leschen man for one, or write.

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
St. Louis 12, Missouri

LESCHEN
HERCULES Red-Strand
WIRE ROPE

For more facts circle 595 on Reply Card



OVERHEAD TROLLEY CONVEYERS

one of the many types of high-quality power and gravity conveyers in the MATHEWS Line

Overhead Trolleys are among the most frequently applied types of power conveyers. They are used to serve processing machines, move material from one area to another, take components through painting, drying and enameling operations, and are, in fact, an extremely versatile type of equipment. Trolley Conveyers can be lowered, through the use of transverse bends, to working areas so that parts may be placed or removed from hooks or trays. They are used for storage conveyers, holding materials until needed and saving valuable floor space for production machines.

• Write for catalog HB53 for complete details of Trolley Conveyers and for other types of Power Conveyers and Special Conveying Machinery, or for Catalog No. 853, featuring numerous installations that might help you with your conveying problems. Both catalogs are yours for the asking.

MATHEWS CONVEYERS

GENERAL OFFICES . . . *Mathews Conveyer Company*
ELLWOOD CITY, PENNSYLVANIA

PACIFIC COAST DIVISION . *Mathews Conveyer Company West Coast*
SAN CARLOS, CALIFORNIA

CANADIAN DIVISION . . . *Mathews Conveyer Company, Ltd.*
PORT HOPE, ONTARIO

Engineering Offices or Sales Agencies in Principal American and Canadian Cities

For more facts circle 596 on Reply Card

NEW BOOKS

for the plant engineer

Economics and the Engineer

INTRODUCTION TO ENGINEERING Economy by B. M. Woods and E. P. DeGarmo. Size 8½ by 5¾ in.; 510 pp including index. Published by the Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. Price $6.00.

IN ADDITION to having responsibilities of a technical nature, the engineer of today is confronted with problems demanding a knowledge of finance and economy. For those whose know-how on these subjects is limited, here is a helpful book. Although specifically written for the undergraduate student, it contains much information that comes in handy for the practicing engineer.

The introduction to the book considers such topics as capital requirements of industry, the engineer's relation to industry; and importance of human factors. The book goes on to cover among other topics the selection of materials, methods, and design. Interest, annuities, stocks, bonds, formulas for calculating interest and depreciations are also given attention.

Some of the main sections of the book are as follows: financing engineering enterprises; fixed, differential and sunk costs; replacement; the use of graphical methods of analysis; life expectancy of physical property; and the relationship of accounting to economy studies.

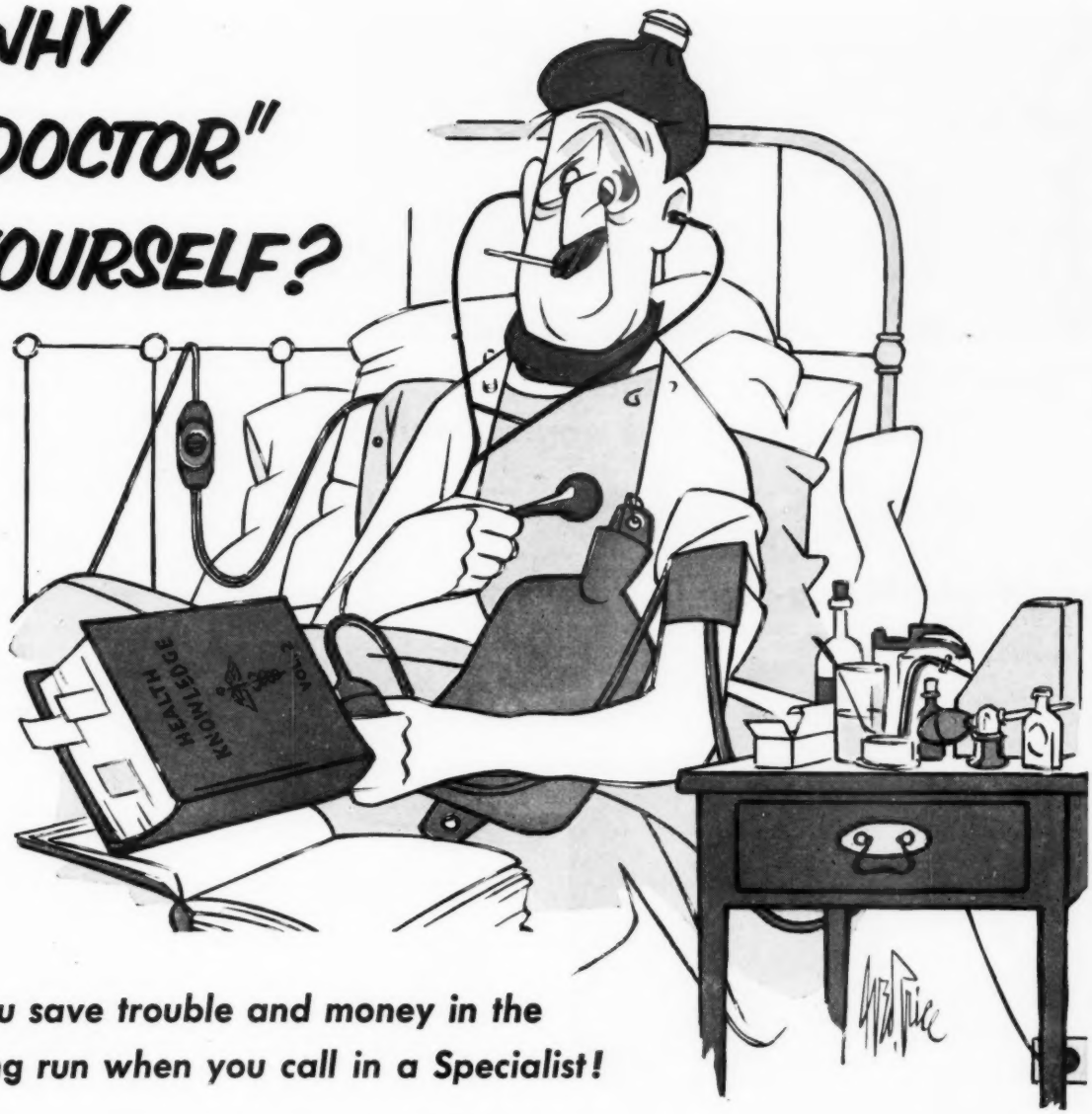
On Water Conditioning

BETZ HANDBOOK OF INDUSTRIAL WATER CONDITIONING; 250 pages, illustrated; size 8½ by 11 in.; flexible fiber binding; published by W. H. & L. D. Betz, Gillingham and Worth Streets, Philadelphia 24, Penna. Price $3, postage prepaid.

THIS NEW 4TH EDITION of the Betz Handbook of Industrial Water Conditioning offers a practical up-to-date text for reference or study. Although it is basically a technical publication, the subject matter is presented in a direct, simple and easy-to-understand form. With this handbook, one does not need specialized knowledge of water chemistry and engineering to understand the basic problems involved and the latest developments in water technology.

The introductory chapters of the handbook deal with basic water treatment processes such as aeration, coagulation, softening, etc. The following chapters are concerned with specific water problems, particularly problems encountered in boiler water and cooling water conditioning. Applications and limitations of

WHY "DOCTOR" YOURSELF?



You save trouble and money in the long run when you call in a Specialist!

Prescribing lubricants for your complicated machines is, in a way, like prescribing medicine for yourself... a single mistake can be fatal. That's why it pays to call in a Specialist for consultation and advice when lubrication problems arise.

Socony-Vacuum has been serving industry for 88 years—far more than any other oil company. During this time we have built up a vast storehouse of lubrication knowledge and experience—have used this priceless information to develop top-quality oils and greases for every industrial need.

Working with you, we will apply this knowledge to diagnose your lubrication needs, prescribe the right oils and greases—install a program of Correct Lubrication. This cooperative effort will improve your production—reduce your maintenance costs.

Can you afford to accept anything less for your plant? Call your Socony-Vacuum representative.

Socony-Vacuum

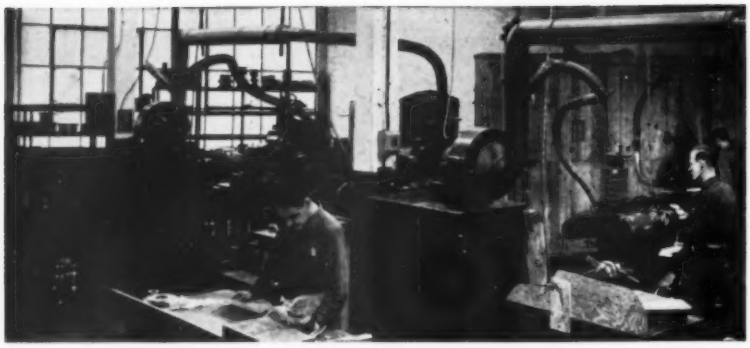
SOCONY-VACUUM

Correct Lubrication

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

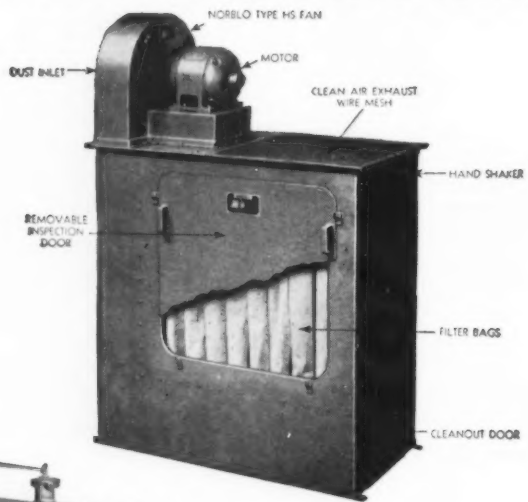
For more facts circle 597 on Reply Card

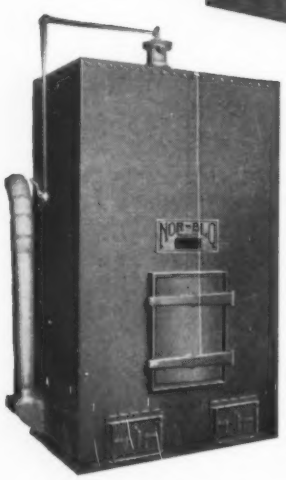


Keep workroom air clean—
protect work and workers with

Norblo

Portable bag-type Dust Collectors





Many plants can be effectively and profitably equipped with Norblo Portable and Semi-Portable Dust Collection Units, to remove unhealthful and sometimes dangerous contaminants from dust-producing machines. Localized dust control for grinding, polishing, sawing and other operations is thus provided at much lower cost than with a large centralized system.

Norblo Portables occupy small space, can be elevated to save floor area. And they're easily moved if re-location of machines proves desirable. Units are available in various arrangements for dust clean-out. Six sizes range from 300 to 1350 C.F.M., operate at 8" static pressure at the fan. Also larger sizes—semi-portable. Write for Bulletin 163-5.

The Northern Blower Company

Engineered Dust Collection Systems for All Industries

6423 Barberton Ave. OLympic 1-1300 Cleveland 2, Ohio

For more facts circle 598 on Reply Card

various water-treating equipment and methods are covered in detail.

The handbook has been carefully organized for quick reference or easy study in any or all phases of industrial water conditioning. It is a valuable, time-saving "tool"—not only for engineers working directly with water problems, but also for management executives, consultants and others concerned in some degree with water conditioning in industrial plants.

This 4th edition contains 50 more pages than the last and, in looking through both, new and up-to-date material appears in every section.

Open-Hearth and Electric Furnaces

COMPARATIVE ECONOMICS OF OPEN-HEARTH AND ELECTRIC FURNACES for Production of Low-Carbon Steel. Size 8½ by 11 in.; 1953 edition; 77 pp; illustrated; paper bound. Published by Bituminous Coal Research, Inc., 2609 First National Bank Bldg., Pittsburgh 22, Pennsylvania. Price $10.00.

OPEN-HEARTH and electric furnace processes of steelmaking are compared in this booklet on the basis of space requirements, capital costs, construction time, performance, and present and future costs.

Fuels and gases, electrodes, steel scrap, hot metal and electric power are discussed as factors in future costs. A table gives a comparison of fuel costs in various states and areas. Future trends in steelmaking costs for open-hearth and electric-furnace processes are predicted.

The material in the booklet is based upon a study sponsored by the Electric Furnace Survey Group, comprising 14 electric utility companies and Bituminous Coal Research, Inc. Data on capital and operating costs were obtained from a considerable number of steel companies, engineering construction firms, and equipment manufacturers, according to a summary in the report. Tables and charts are used extensively throughout the booklet.

Looking at Tin

SYMPOSIUM ON TIN. ASTM Special Technical Publication No. 141. Size 9 by 6 in.; 111 pp; paper bound. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., Price $2.50.

TIN IS THE ONLY major common metal not covered by specifications of the American Society for Testing Materials. This publication was prepared to give the factual information on tin which came out of the second and fourth sessions of the 55th annual meeting of the ASTM held in New York on June 23, 1952.

Compiled information on tin is presented and discussed in this symposium. Some of the topics include: tin production and resources; production and uses of tin coatings;

Team up with Mercury

GET THE JOB DONE FASTER – EASIER – AT LOWER COST

★ **Over 41 Years Experience in the Designing, Manufacturing and Installation of Material Handling Equipment.**

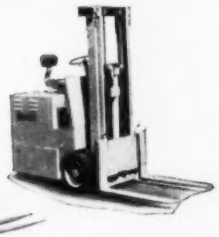
★ **The Most Complete Line of Equipment for BOTH Vertical and Horizontal Handling.**

★ **Originators of the Mercury "TRACKLESS TRAIN" System of Materials Handling.**

FORK TRUCKS

A few of the outstanding quality features of Mercury Fork Trucks include—*simple, single cylinder low* pressure hydraulic lift with patented cross suspension . . . magnetic contactor travel control with foot actuated, timed acceleration and controlled plugging . . . shockless wheel steering by means of compensating, controlled castor type trail axle . . . double reduction unit assembled drive.

"YAK" FORK TRUCK Model 430
4,000 lbs. capacity



"JEEP" FORK TRUCK
Model 230
2,000 lbs. capacity

"YANK" FORK TRUCK
Model A-1544
6,000 lbs. capacity

TRACTORS AND TRAILERS

"Tug" Electric Tractor: Available in 3 capacities and 3 wheel, twin-3 or 4 wheel types.
"Banty" Gas Tractor: The smallest tractor made, yet develops a draw bar pull in excess of 2,000 lbs.

Also, "Huskie" and "Super-Huskie" gas tractors, 4 and 6 wheel heavy-duty models.
Trailer: Available in castor, 5th wheel or 4 wheel steer, platform or side dump types.

The Mercury "Huskie" tractor hauling a train of loaded Mercury type A-310 trailers in a large electrical manufacturing plant.

PLATFORM LIFT TRUCKS

Illustrated right is "Shuttle-Truk" 3-wheel burden carrier, 2,000 lbs. capacity. Illus. left is "Standard" high lift truck, 6,000 lbs. capacity.
Complete line includes narrow or wide models rated at 3,000, 4,000, 6,000 and 10,000 lbs. capacity with low, high or telescopic lift.

The Mercury Model A-1006 narrow type 4,000 lbs. capacity high lift truck stacking skids of corrugated paper in a carton manufacturing plant.

MERCURY
FORK TRUCKS · TRACTORS · TRAILERS

FREE Bulletin 300, a new 44 page catalog illustrating and describing the complete MERCURY line of Fork Trucks, Tractors, Trailers and Platform Lift Trucks.

MERCURY MANUFACTURING CO., 4002 S. Halsted St., Chicago 9, Ill.

For more facts circle 599 on Reply Card

WARREN-QUIMBY

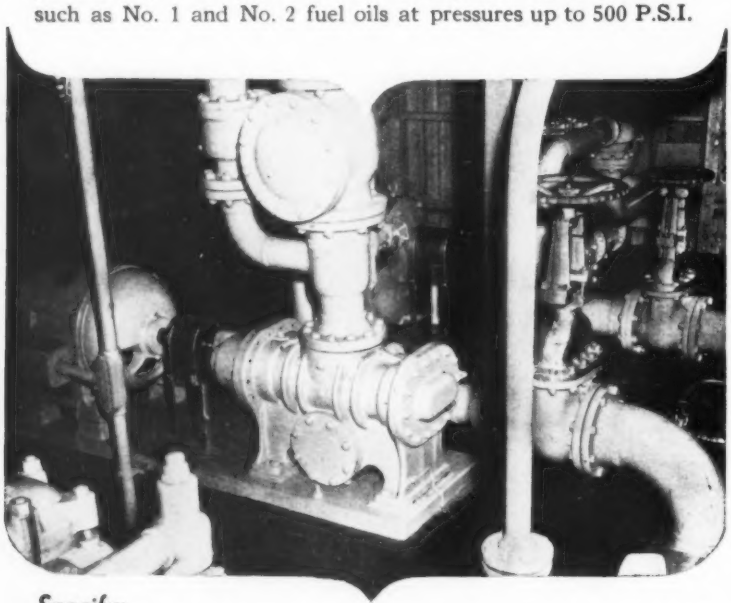
Standard Gear-In-Head Screw Pump on Fuel Oil Unloading Service at FLORIDA POWER CORPORATION

Avon Park Station

This type of Warren-Quimby Screw Pump has long been in successful service in the handling of fuel oils, lube oils and various other lubricating liquids. It is essentially a pump for high pressure applications and is available in three general types of construction:

1. **Anti-friction bearing design**
2. **Anti-friction bearings with fixed center bearing**
3. **Sleeve bearing design**

Also, a Long Body Gear-In-Head Pump is built for high pressures when handling light hydraulic oil and other applications for pressures up to 1000 P.S.I., and for very low viscosity liquids, such as No. 1 and No. 2 fuel oils at pressures up to 500 P.S.I.



Specify:

Warren-Quimby Screw Pumps

• *First in America* • *First in Dependability* • *First in Preference*

WARREN QUIMBY PUMPS

PQ-4

WARREN STEAM PUMP COMPANY, INC.
Warren, Massachusetts

For more facts circle 600 on Reply Card

use of tin in the container and automobile industries; determination of small amounts of impurities in tin; and effects of impurities on the properties and uses of the metal and alloys containing tin.

Handling Information

MATERIAL HANDLING. Booklet No. 3 of the Library of Know-How. Size 8½ by 11 in.; 10 pp; paper bound. Published by The Material Handling Institute, Inc., 811 Clark Bldg., Pittsburgh 22, Pa. Price 50 cents.

MATERIAL HANDLING is discussed in this booklet in relation to other functions of planning and managing an industrial enterprise. These related functions include: process engineering, tool design, industrial engineering, plant layout, production and material control, purchasing, production, accounting, maintenance, personnel, quality control and inspection, and product design.

The booklet also analyzes materials handling by work-volume and work density.

► Note: PLANT ENGINEERING has a limited number of copies of this booklet available for free distribution to interested readers. If you would like a copy, simply write "Material Handling Booklet" on one of the post cards appearing in this issue.—*Editors.*

Production, Controls, and Supervision

MANUFACTURING SERIES. Published by American Management Association, 330 West 42nd St., New York 36, N. Y. Price $1.25 (non-members), $1.00 (members).

PRODUCTION GUIDES AND CONTROLS for the Modern Executive, No. 211, 52 pp. Planning in a manufacturing enterprise and predetermined time and motion study are two papers presented in this booklet dealing with guides and controls for the executive. Meeting "hard-sell" times and uses and basic concepts of research are other papers included.

GEARING UP FOR BETTER PRODUCTION, No. 212, 58 pp. Getting the most from engineering is the title of one of the papers in this publication. This paper discusses how to go about organizing and managing an engineering function. Other papers deal with production planning and control, gearing up the sales machinery, and the job of the chief manufacturing executive.

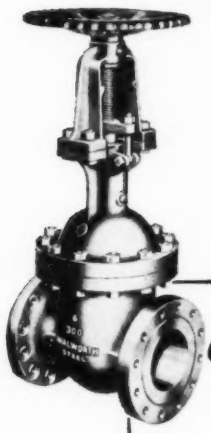
BUILDING UP THE SUPERVISOR'S JOB, No. 213, 35 pp. This publication is concerned with the foreman and his relationship to industry. Two of the papers that are presented deal with the status of the foreman and communication with him. The line manager's responsibility for human relations and foreman cooperation are also treated in the booklet.

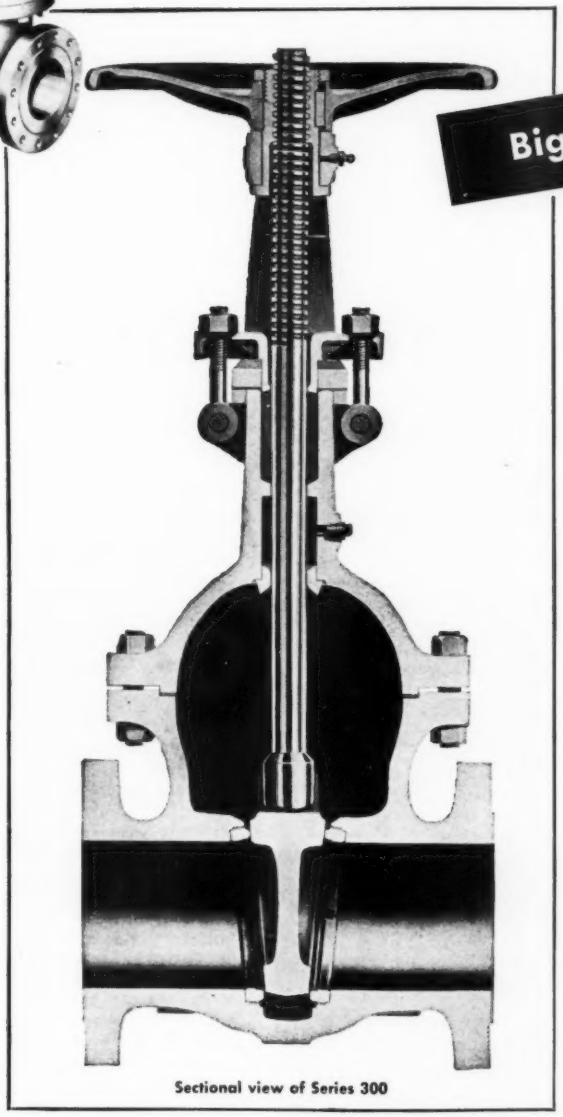
WALWORTH

Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke





Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2" to 24") insure tightness and maximum packing life – costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion – they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated – not flange type. No recess exists at back of ring – hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

WALWORTH

valves and fittings

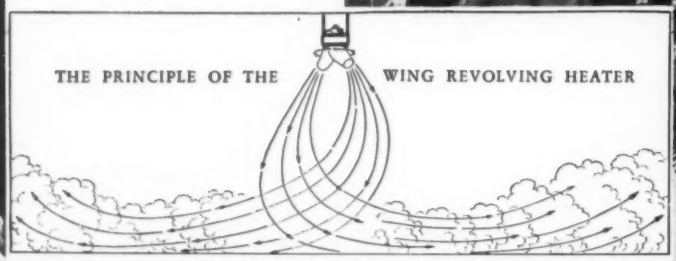
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

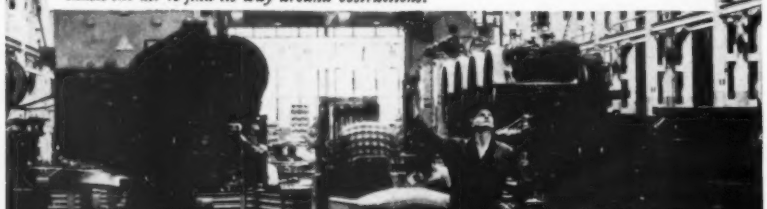
For more facts circle 601 on Reply Card

HEAT THAT MOVES AROUND

THE fact that the discharge outlets of WING Revolving Unit Heaters keep the heated air in constant, gentle motion is one of the reasons why nationally known firms like the Budd Company have installed them in their plants, both at Philadelphia and in the one shown in this photograph, at Gary, Indiana. The big blanking and forming presses in this great plant present a natural barrier to ordinary fixed discharge heating systems, but not to the moving streams of heated air from the WING Revolving Heaters, even suspended, as they must be, far above the floor, to clear the cranes. That is equally true in the summer time when, with steam turned off, the cooling breezes from the revolving discharge outlets keep workers comfortable on the hottest days. Investigate. Write for Bulletin HR-6.



The moving streams of heated air (or cooling breezes in summer) sweep slowly around through 360 degrees, covering successively every direction. The air velocity is sufficient to carry to walls, and remote corners and the constantly changing direction of flow causes the air to find its way around obstructions.



Wing

L. J. Wing Mfg. Co.
177 Vreeland Mills Road
Linden, New Jersey
Factories: Linden, N.J. and Montreal, Can.
In Europe: Etab. WANSON, Brussels, Belgium

For more facts circle 602 on Reply Card

Plant Conversion

(Continued from page 83)

room will be located their project office—a kind of localized production control center. We think this is going to convert 'impersonalization,' a factor endemic to big plants, into family-sized, friendly production units. And we think it's going to be a helpful tool toward greater production."

Thus, Douglas production executives expect a plant, never designed for production lines in the real sense, to be a kind of test-center toward "personalization" and project self-sufficiency.

The plant is currently being repainted—aluminum heat-reflecting paint replacing black, heat-absorbing, tar-impregnated asbestos. Indications point to a minimum 8-degree heat reduction in summer, less heat loss in winter. A big, new lighting installation sees 50 footcandles at workbenches and machines. Also newly installed (old plant had no heating) are 49 oil-fired, cast iron heat exchangers with blowers. Four have been mounted in each shed, five in the shipping area. Each is rated 880,000 Btu.

"Based on square footage," says assistant plant engineer L. D. Bisher, "the reconversion should go down as a speed record coupled with noteworthy economies."

Preventive Maintenance Systems

(Continued from page 105)

or immediately after the preliminary survey which has instigated the decision. Otherwise, there will be trouble due to lack of interest, and other inherent characteristics of human beings.

No consulting engineer, or industrial engineer within an organization, can write a good working procedure for preventive maintenance without the assistance, advice, knowledge and help of the plant's maintenance men. An exchange of knowledge of specific nature is required. This must be freely and openly given without equivocation or restraint due to individual and personal feelings.

The more the employees know about preventive maintenance, its benefits and how it will affect them personally, the more freely they will give of their knowledge, background and experience. Indifference or contempt for the new procedure spells only trouble.

Maintenance tradesmen seem to have an inherent dislike for paper work. These men must be made fully cognizant of the importance of completing inspection forms as inspections are made. If this is not done, errors will occur on reports or complete information will not be entered. This could result in erroneous decisions by the man who

Remington Rand Methods News

More Plants Slashing Maintenance Costs... Keeping Production At Peak

New Booklet On Preventive Maintenance Gives Flow Chart For Effective Control

Are *more than* 5 out of every 100 of your production workers doing plant maintenance? That's what a recent survey of manufacturing plants in the U.S. established! Is it any wonder that the latest developments in Preventive Maintenance Records, displayed at the Plant Maintenance Show held in Chicago in January, attracted sensational interest?

If you missed that exhibit, send today for our new free booklet X1383, showing in detail just how a planned maintenance control system works... how easy it is to install... how it insures maximum equipment productivity at greatly reduced operating cost.

These methods visually indicate what inspections are needed... permit scheduling of work ahead. Every man's time can be planned for maximum efficiency. Simplified visible methods provide tight control with paperwork streamlined to an absolute minimum.

The requirements of any such system are the same regardless of the size of the work force. They should include *all* of the following: 1) Written Work Orders 2) Scheduled Work 3) Equipment Records 4) Stores Control 5) Executive Reports.

Actually, maintenance management simply can't do a bang-up, cost-conscious job without a planned system with effective records providing all the facts for making sound decisions. The system offered in our booklet virtually gives you those facts at a glance!

Get this new booklet today. Study the flow chart showing effective Planning, Performing and Controlling of a Maintenance Program. See illustrations and descriptions of basic records which well-known plants are successfully using to put their maintenance operation on the same efficient basis as other operating departments. Ask for **X1383.**

Punched Cards Can Help Medium-Sized Plants, Too!

One west-coast tool manufacturer, with 675 employees, centered all its production-control, cost records, payroll, inventory control, sales analyses and special reports in *one* 5-clerk department with punched-card procedures.

In sales analyses alone punched cards gave them a report that previously took 37 days, *in the amazingly short time of 3 days!* In the words of their chief accountant:..."it would have been difficult to operate with anything like our present efficiency, without these economical and *complete* accounting controls." See **Certified Report 804.**

Do Your Filing System & Files Need Modernization?

It has been proved that 65% of the file records in the average company are useless... take up valuable space... slow down efficiency of the organization. It may pay you to call in a Remington Rand specialist and have him analyze your record-keeping problem. He has showed many leading companies how to increase efficiency and save lots of time and money. And this service is performed without disturbing or interrupting your daily operations in any way.

Our Business Services Departments recently made just such a study at the Newport News Shipbuilding and Drydock Company. Result: 60 years' accumulation of records are now streamlined and systematized... future expansion provided for... at great savings in money, space and clerical help. Reference is simple, whether it be to Hull No. 1 completed in 1891, or the new United States... which job alone, an official states, would have "buried" the company under "an unmanageable sea of paper" but for the "work done by Remington Rand experts". Read this interesting Certified Report written by an official of Newport News Shipbuilding. Ask for **CR850.**

Timken Roller Bearing Effects Big Savings Using Kard-a-Film For Personnel Records

Let this Certified Report written by an official of the Timken Company show you why personnel records need to be kept indefinitely... how an ordinary file drawer which formerly held 3,000 to 4,000 letter size records, now holds 250,000 documents!

Further, how Kard-a-Film records filed under the Variadex system makes for such speed of filing and reference that Timken now actually locates a "dead" personnel record as easily and quickly as one in the active file!

Read how Timken first tried microfilm on conventional reels only to find these unsatisfactory for a personnel records file. Kard-a-Film holds microfilm records on cards—all grouped by a particular subject rather than isolated

on a number of different microfilm spools. Documents no longer used can be kept up-to-date. Kard-a-Film Reader shows the records actual size right from the card and makes accurate inexpensive reproductions. Your personnel records are important to your company, your employees and others in your plant town get the benefit of Timken's experience. Get **CR867.**

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1-16

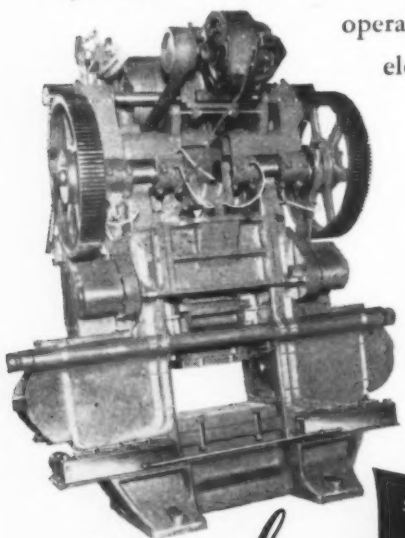
– Profit-Building **IDEAS** For Business –

IT COSTS TOO MUCH NOT to have Manzel Lubricated Machinery

Add the cost of:

1. **Breakdowns due to faulty lubrication.**
2. **Wasted oil (Manzel cuts it up to 90%).**
3. **Labor in hand oiling.**

...and you'll agree Manzel Force Feed Lubrication costs *less.* Manzel lubricators are furnished as standard equipment on many leading makes of presses, shears, pumps, engines and other machinery. They can be installed on your present equipment —synchronized by ratchet or direct lever drive, or operated by a separate electric motor.



We will gladly have a Manzel lubrication engineer submit recommendations without obligation. Just write . .

Safeguard high priced machinery with MANZEL FORCE FEED LUBRICATION
- Reduce Wear
- Prevent Breakdown
- Slash Oil Consumption
- Insure Round-the-Clock Operation

Manzel

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must determine the extent of necessary repairs. Without cooperation from the men who make the inspection and do the maintenance work, the system cannot possibly be successful.

Several references have been made to the control system for preventive maintenance. A standard of procedure is first established. This includes forms used and complete directions and instructions for the use of these forms and execution of the procedure. A 'date file' or 'tickler file' is a necessary adjunct. The file actually is the basic instrument of control. Each day the file is checked and the work for that day is automatically brought to the attention of a scheduling clerk who assigns inspection duties and distributes the necessary inspection forms and instructions. After completion of the assignments, the tickler file card is relocated under a new date for automatic appearance in accord with the procedure.

As the inspections are completed and returned to the maintenance office clerical department, the reports are checked and proper authority then determines the extent of the maintenance work which will follow. Scheduling of the work then becomes a routine matter for the clerk.

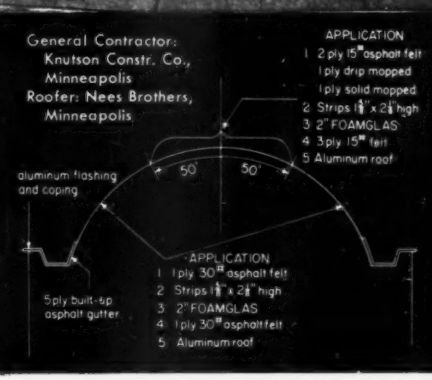
In a company already operating with an organized maintenance division, the standard procedure for handling maintenance work can, in all probabilities, be used in conjunction with the preventive maintenance procedure and the two combined to form one complete operation standard for the maintenance division. In a company where maintenance does not operate under a control procedure, it will be advisable and practical to set up a control system. This can be done when the preventive maintenance procedure is set up.

A chain is only as strong as its weakest link. The best, the most comprehensive preventive maintenance procedure that can be devised will not produce the intended results if the weak link in the chain lies in maintenance division personnel. It is this division that puts the procedure to practical application. It is false economy of the worst kind to fix salary ranges in below normal ranges.

Fewer but more competent and more capable men paid at levels which will not only attract but hold them to their positions once hired, is more expedient than a large group of incompetent, dissatisfied, disinterested and incapable men.

The old saying "The best is the cheapest in the end" still is true, always with the proviso that it can be afforded. A policy of this nature will insure a proper preventive maintenance procedure and efficient application resulting in higher percentages in efficiency, lower costs and greater profits.

General Contractor:
Knutson Constr. Co.,
Minneapolis
Roofer: Nees Brothers,
Minneapolis



18,000 Gopher fans made "rain" until field house roof was insulated with FOAMGLAS

Large crowds in the University of Minnesota Field House used to be crackerjack "rainmakers." How? . . . They generated so much humidity that the original insulation on the roof became water-soaked. Then there was nothing to prevent condensation from forming on a cold underside of the roof deck. "Rain" literally fell in the field house. During a basketball game, for example, play had to be stopped frequently to mop up the floor.

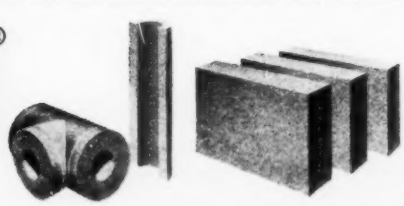
FOAMGLAS, the cellular glass insulation was picked to solve this problem in 1948. It hasn't rained since. The sealed glass cells of FOAMGLAS *can not* absorb moisture, assuring constantly high insulating performance despite the high humidity inside and the frequently extreme outside temperatures in the Minneapolis area. The roof curvature was no problem with easily handled blocks of FOAMGLAS, readily shaped and fitted where necessary and with sufficient strength and rigidity to permit easy, efficient application to the roof.

Whatever *your* insulating problems may be, FOAMGLAS is the ideal answer. This strong, stay-dry insulation guarantees efficient insulating service plus unique design advantages. Let us send you our new booklets describing the use of FOAMGLAS to insulate roofs, walls, floors, ceilings, piping or equipment in normal or low temperature buildings. Write, to Dept. AK-24 . . .

PITTSBURGH CORNING CORPORATION • One Gateway Center • Pittsburgh 22, Pa.

FOAMGLAS®

the cellular, stay-dry insulation



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Pittsburgh Corning also makes PC Glass Blocks

SELECTING THE RIGHT CRUSHER*

For every crushing job there is always one specific type and size crusher that is more economical and efficient than all others—it's the machine that will give the desired finished product, in the volume required, at the lowest cost per ton. Yet, it is to be expected that the crusher manufacturer will limit his recommendation to the machine he makes. If he makes only one or two types of crushers his range of selection is limited. So is your chance of getting the best machine for your particular job. Always get an analysis and recommendation from the manufacturer that has a large and varied line.

PENNSYLVANIA CRUSHERS

Bradford Breakers
Bradford Hammermills
Bradmills
Reversible Hammermills
Non Reversible Hammermills
Ring Hammermills
Dixie Hammermills
Dixie Non Clog Hammermills
Single Rolls
Reversible Impactors
Kue-Ken Jaws
Kue-Ken Gyracones

*We will be glad to send you a copy of the Handbook of Crushing. This book contains data on mechanical size reduction that is not available anywhere else. Pennsylvania Crusher Company (division of Bath Iron Works, Inc.) 1763 Liberty Trust Bldg., Philadelphia 7, Pa.

For more facts circle 606 on Reply Card

INDUSTRIAL FILMS

History and Uses of Felt

THIS 30-MINUTE COLOR, sound film, "The Miracle of Felt," opens with the legend about the discovery of felt in the sandals of a monk walking through the sea to the abbey Mount St. Michel. The entire phases of felt manufacture are then shown. Latter half of the film shows the numerous important end uses for the material.

Inquiries should be addressed to American Felt Co., Glenville, Conn.

"Project Tinkertoy"

THIS NAVY TRAINING FILM, "Project Tinkertoy," sponsored by the Navy Bureau of Aeronautics, shows the automatic production-line manufacture of electronic parts. Such mass production has been made possible by a new system of electronic design developed by the National Bureau of Standards.

Starting with the raw or semi-processed materials, the film presents the story of automatic manufacture of ceramic materials and adhesive carbon resistors, print conducting circuits and mount resistors, capacitors and other miniaturized components on standard, uniform steatite wafers.

"Project Tinkertoy" (MN-7460) may be obtained for non-profit, non-theatrical, educational showing from United World Films, Inc., 105 E. 106th St., New York 29, New York.

Handling an "Underwater Giant"

"UNDERWATER GIANT," is a vivid and technically complete history of the manufacture and laying of a three-quarters of a million pound submarine power cable.

This 20-minute 16mm picture reveals the extensive design and construction effort that went into the 7½-mile long high voltage, rubber-insulated underwater "giant" now crossing Puget Sound, that required 1400 miles of copper wire and 18 tons of rubber.

The film documents the history of the cable from the time it was designed until the final foot was submerged. Shots of the manufacturing operation show how the cable was assembled and tested and how the unusual handling problems created by its size were solved in the factories. The single shipping length required nine freight cars.

Technical societies, utilities, industrial organizations, universities and other interested groups can arrange for viewing dates by writing to the Motion Picture Department, The Okonite Company, 101 Canal Street, Passaic, N. J., specifying a choice of dates.

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Why this announcement is important to YOU:

(1) OFFERS GREATER PROTECTION FOR ELECTRICAL CIRCUITS

Wherever overloads are likely to occur, ECON Dual-Element Fuses now bring the time and money savings that result from positive, dependable controlled protection against unnecessary blowouts — as well as against short circuits. The unique design and construction of the ECON Dual-Element also insures better protection against single-phasing, eliminates the necessity of over-fusing, and results in cooler fuse holders and switches.

(2) MAKES THE ECONOMY LINE MORE COMPLETE THAN EVER

In keeping with the policy of offering "Fuses for Every Purpose," Economy is constantly adding new and improved fuses and other circuit-protection products to help solve unusual fuse problems. Thus, Economy Fuse & Manufacturing Co. rounds out its line still further with a new dual-element fuse that offers many special features and advantages.

Write for New ECON Dual-Element Cartridge Fuse Catalog, S-60 or for literature on other type fuses.

ECONOMY fuses for every purpose

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"If our executives did not read BUSINESS PUBLICATIONS I'd consider them unfit for their jobs"

Col. Willard F. Rockwell,
Chairman of the Board,
Rockwell Manufacturing Company

"We feel the same way about our sales managers," Colonel Rockwell continues. "We expect them to know what is being printed in the business publications and to guide themselves accordingly. Further, we ask our salesmen to keep our home office informed about the comments of our customers on business periodicals."

Like Colonel Rockwell, other business and professional leaders the country over are reading business publications covering their fields of activity. They are getting from these magazines vital information about new products, new methods, new marketing trends, price and distribution changes through the advertising as well as the editorial pages. The Business Press offers a direct route to anyone who has anything to sell to business and professional men.

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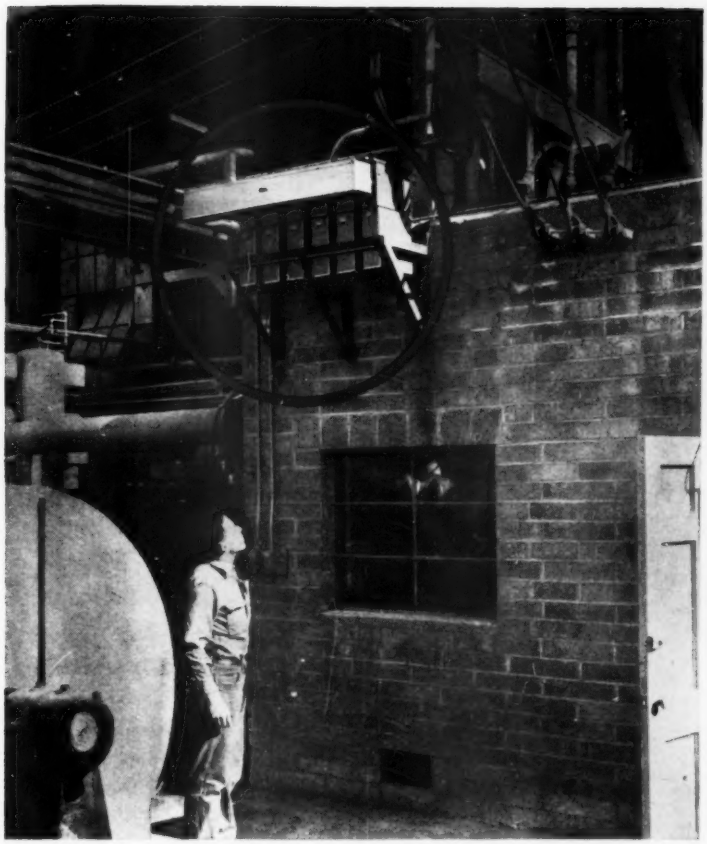
Prevents transformer "burnouts." This 90-kvar, 3-phase, 60-cycle, 460-volt G-E capacitor equipment (circled) helps relieve transformer overloading. Solomon Fingold, Montrose Chemical's electrician, surveys it appreciatively.



Overloaded transformers relieved with G-E Capacitors

Montrose Chemical Corp. of Calif. prevents transformer "burnouts," saves $1800 a year on power costs . . . with $1451 investment.

Rapid postwar expansion put a heavy overload on the transformers that supply power to the Montrose Chemical Corp. of California, located in Los Angeles. Recently, when the overload became critical, the Company sought help. An investigation showed that the plant's power factor was down to 76%—so General Electric engineers recommended the installation of 180 kvar of General Electric capacitors at a cost of $1451.

Capacitors improve power factor. Once installed, the capacitors brought the plant's power factor up to better than 97%. This relieved transformer overloading by reducing line current. And since Montrose Chemical had a power-factor clause in its power contract, it also cut power costs by $1800 a year. Thus, the saving on power costs alone will pay for the equipment in less than ten months! *And these savings will go on indefinitely.*

Capacitors provide other benefits, too! Besides releasing transformer capacity, capacitors often permit your present distribution system to carry 20 to 30% more load without added equipment. Where voltage drop is a problem, capacitors can also provide the needed voltage boost inexpensively.

They often hold key to lower power costs. If your power factor is below 85% and if there is a power-factor or kva-demand clause in your power contract, chances are you, too, can make worthwhile savings on your power costs by installing capacitors. For additional information, consult your local G-E Apparatus Sales Office or authorized G-E agent or distributor. Or write to Section 407-210 for Booklet GEA-5632—"How to Use Capacitors to Reduce Power Costs and Gain System Capacity." General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

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Which Bearing?

(Continued from page 110)

quirements of every type of machine. New lubricants and new methods of application are being developed continually. Research and development are constantly raising the standard of lubrication products.

Unlike plain or sleeve type bearings, ball and roller bearings are not dependent upon an oil film to separate the load carrying members.

The reasons for lubricating both ball and roller bearings are basically the same. They are: 1. To minimize friction between the rolling elements and raceways and rolling elements and retainers. 2. To protect the accurately ground bearing surfaces from corrosion. 3. To help protect the bearing from foreign matter. 4. To dissipate some of the heat of operation.

It is conceded by bearing manufacturers that oil is preferred for the general run of ball and roller bearing applications. However, due to practical reasons it is desirable to lubricate many ball and roller bearing applications with grease or grease products.

In many ball and roller bearing applications oil or grease can be used with equally good results, whereas in others, one type of lubricant is clearly indicated. The important factors in making a choice of lubricant for ball and roller bearing applications are operating conditions, temperature, speed and design of housing. The latter includes the methods or provisions for introducing lubricant into the bearing and designs and types of seals and closures used with them. The subject of seals and closures for ball and roller bearings will be discussed in some detail in a subsequent section of this article under the subtitle "Seals and Closures."

Grease Lubrication

There has been a number of methods suggested and recommended for lubricating and relubricating ball and roller bearings with grease but there is no method at the present time which gives absolute control of the quantity of grease in a bearing housing. However, it has been found from actual field experience that a ball or roller bearing housing fitted with unit or lip type synthetic rubber seals and pressure relief fittings as shown in Figs. 5 and 7 comes as near to the ideal controlled lubrication of ball and roller bearings as is practicable.

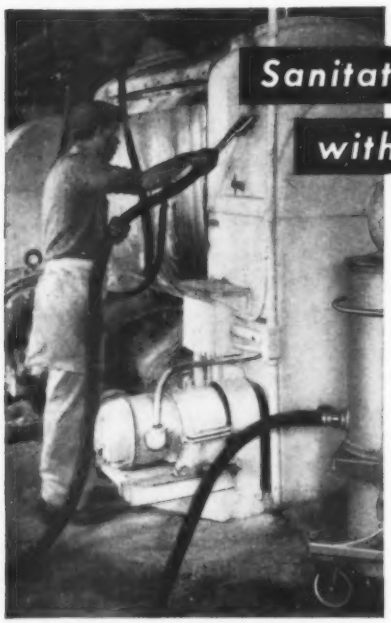
In these two designs, the press fit unit or lip type seals will stop leakage of the lubricant from the bearing housing and the low pressure relief fitting will prevent over-lubrication and guard against imposing undue pressure against the seals. The risk of under-lubrication of ball and roller bearings is obvious, but the dangers of over-lubrication are even more serious resulting in power losses, overheating caused by internal friction, excessive wear of the bearings and wasting of the lubricant.

With grease guns, grease lubrication of ball and roller bearings is more or less guess work. In many plants it is customary for the lubricating and maintenance personnel to "give her the gun" and trust to luck, the result usually being a "packed" bearing. This problem has been obviated to a large degree by the use of pressure relief fittings as shown in Figs. 5 and 7 previously described and illustrated.

Choice of Lubricant

As stated previously, no iron clad rule can be followed in the matter of selecting oil or grease for use with ball and roller bearings. The choice often is at the discretion of the ball and roller bearing user. In general, oil should be used for high temperature applications and for any speed condition and any load condition. Generally speaking, greases can be employed satisfactorily for high speed applications and temperatures not in excess of 200 F. When the grease in bearings is subjected to temperatures in excess of 200 F. frequent cleaning and relubrication of the bearings is necessary to secure optimum results unless some of the new, specially processed synthetic high temperature greases, such as those containing silicones, are used.

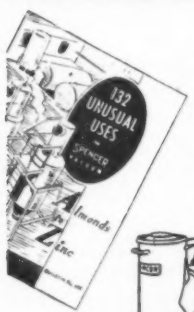
When grease is used in the presence of water as in paper mills and such, its composition must be such



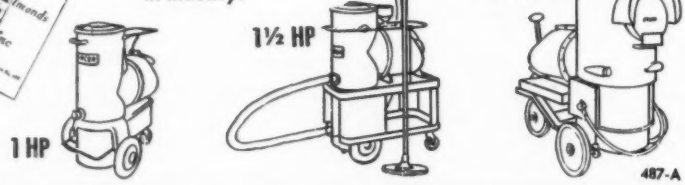
Take the job of handling hot materials, removing fly ash, picking up spilled liquids or handling fine chemical powders. Consider the time saved, the comfort and safety involved when these tasks are done with Spencer Vacuum.

Then consider that these Spencer machines will clean your plant and your machines at night—faster and at lower cost. That you can reclaim foods, chemicals, and metals, can speed up the assembly and inspection lines—in fact you can be sure that not only your plant, but your finished products are always clean.

Spencer representatives have special information on more than 100 special applications that can improve your plant sanitation and increase production.



Send for Bulletin No. 144 describing 132 unusual uses for Spencer Vacuum in industry.



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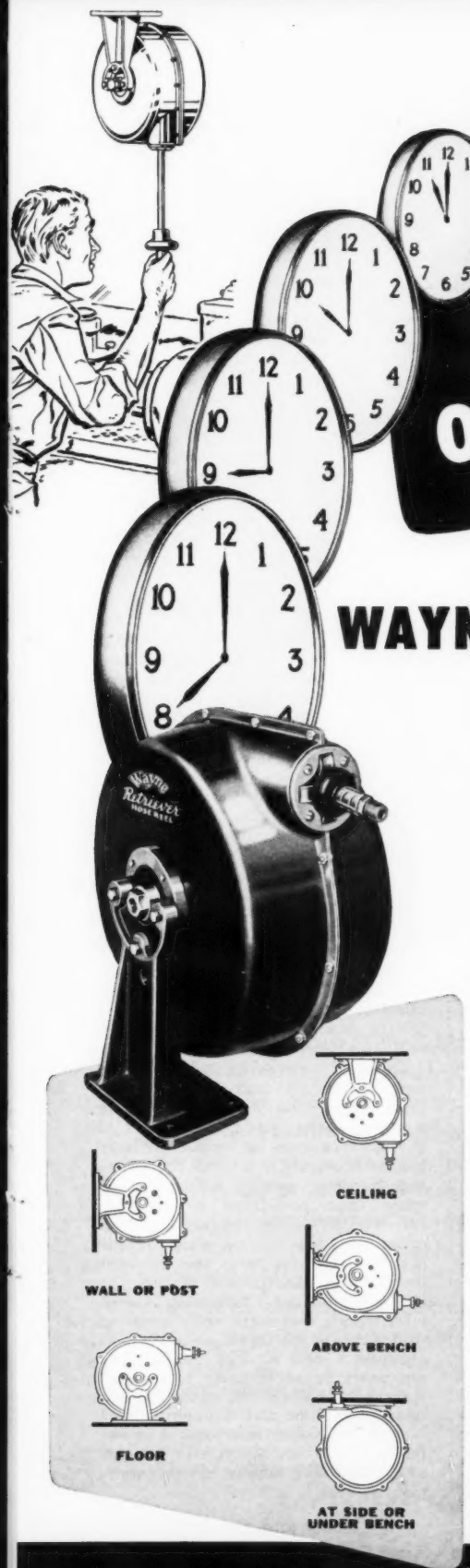

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EASY TO USE: Pull tool or spray gun to required hose length . . . it locks firmly. Slight pull releases catch and hose rolls back automatically to pre-determined setting—just like a window shade!

HANDY TO USE: Tools are out of the way but always within easy reach. Mounts in any position, permits centrally located tool for use by several operators, or one. Saves working space, too.

WORK-SAVING: Cuts waste motion, lessens worker fatigue, widens work-radius. Finger-tip control of tools. Quick installation, easy adjustment, simple maintenance.

Besides all this, the Wayne Hose Reel saves wear and tear on your hose, reduces drop-breakage of tools, prevents accidents caused by loose hose.

Write for illustrated data folders on cost-cutting, job-engineered Wayne Production-Booster Hose Reels.

Compare These Wayne Advantages

Automatic Rewind	Powerful Spring Motor	Automatic Brake
Rubber Bumper Stop	Constant Spring Tension	Universal Bracket
Hose I.D. Sizes, ¼", ⅜", ½"	Rugged Steel Construction	Hose Lengths, 15' to 50'
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NATION WIDE SERVICE

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that it will not easily emulsify.

Lubricant manufacturers have done a commendable job producing oils and greases for use with ball and roller bearings. When unusual operating conditions are encountered such as high temperatures, etc., lubrication experts should be consulted for recommendations based on the particular operating conditions.

The quality of the grease used to lubricate ball and roller bearings is important. Several types are recommended for this purpose. Generally speaking SAE No. 2 and No. 3 greases are recommended.

Ball and roller bearings like other precision devices require the use of high quality oils and greases if optimum service is to be achieved.

Generally speaking, shafts operating below 500 rpm can be safely lubricated with grease. Although shaft speed plays an important role in the selection of oil or grease for ball and roller bearing applications, it is not the only factor that must be considered. The matter of lubricant retention presents another problem. This latter problem is greatly mitigated or simplified by the use of oil tight unit or lip type seals or closures as shown in Designs F and G, Fig. 14, with the bearings. This phase of the subject will be discussed in some detail under the subtitle "Seals and Closures."

Grease, because of its stiffer and heavier consistency, is easier to retain in bearing housings than is oil, and for this reason is often used. A further advantage is that during periods of idleness grease is better able than oil to maintain a protective film over the bearing surfaces.

Figure 11 shows a typical application of a grease lubricated ball bearing using unit or lip type seals, a pressure relief fitting and a drain plug. This design offers the advantage of extended intervals between greasing. In this application the grease is supplied at a point close to one side of the bearing cage, and works its way through the spaces between the balls of the bearing. The housing in this application is so shaped as to direct even the smallest amount of fresh grease to areas in the bearing where it is most needed.

How Often to Re-lubricate

It is not possible to state exactly how often to re-oil or re-grease ball or roller bearings. As stated previously, this depends to a large extent upon the operating conditions and the type of equipment in which the bearings are used. The shop men and maintenance men should be guided by the lubrication instruction plate on the machine or the service manual accompanying it. These instructions should be rigidly adhered to. If such information is not readily available, a general rule to follow is to add a small amount of lubricant to the bearings periodically, carefully watching however, either excess or deficiency of the lubricant and failure of the seals or closures. Observations such as these will definitely determine intervals at which re-lubrication is desirable.

Generally speaking, where oil is used to lubricate ball or roller bearings the housing should be filled to a point where it covers one-half of the bottom ball or roller. Where grease lubrication is used the bearing housing should not be filled more than one-third to one-half full. With grease lubrication it is often possible to use very simple seals or closures with the bearings to confine the grease within the bearing housing. However, somewhat more elaborate seals such as unit or lip-type seals as shown in Designs F and G, Fig. 14, may be necessary in some cases to prevent the entrance of dirt or water into the bearings. Since dirt is enemy No. 1 of ball and roller bearings, it is important to protect them with the best seals available where dirty conditions prevail.

Seals and Closures

The best ball or roller bearing possible will not perform satisfactorily and give a full measure of

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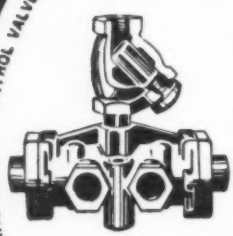
Logan
AIR CONTROL VALVES



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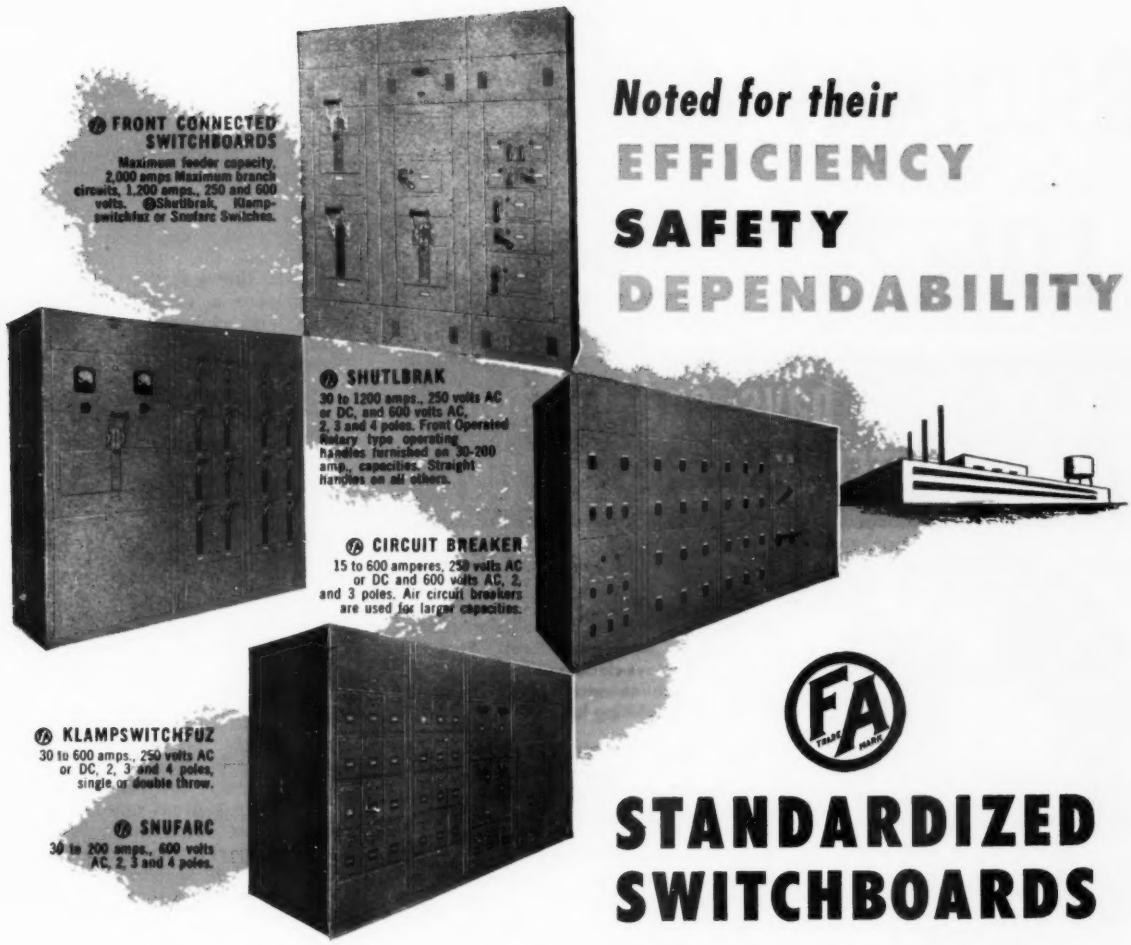
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30 to 1200 amps., 250 volts AC or DC, and 600 volts AC, 2, 3 and 4 poles. Front Operated Rotary type operating handles furnished on 30-200 amp., capacities. Straight handles on all others.
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30 to 600 amps., 250 volts AC or DC, 2, 3 and 4 poles, single or double throw.
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30 to 200 amps., 600 volts AC, 2, 3 and 4 poles.

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Standardized Ⓕ Switchboards are of three main types — the **Shutlbrak,** a safety type switchboard designed for frequent operating use, the **Klampswitchfuz and Snufarc,** which feature a dependable hinged-type, pull-out switch unit for disconnect service on lighting and power circuits, and the **Circuit Breaker**, another safety type, featuring the latest developments in automatic circuit protection.

For use where space is limited, front connected switchboards are also available.

All **Standardized Ⓕ Switchboards** are factory-assembled including bus bars, and are shipped ready for connection of main and branch circuit cables. Units can be arranged singly or grouped, because all sections fit together readily. Removable end walls permit the addition of sections on either side.

Want to know more about these sturdy, long lasting and trouble-free switchboards? Your nearest Ⓕ representative, listed in Sweet's, will be glad to give you complete information.

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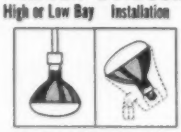

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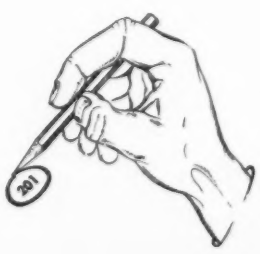


service unless it is protected with good seals or closures. Bearings, lubrication and seals is the important triad in modern machine designs. Bearings and lubrication have already been discussed in this paper.

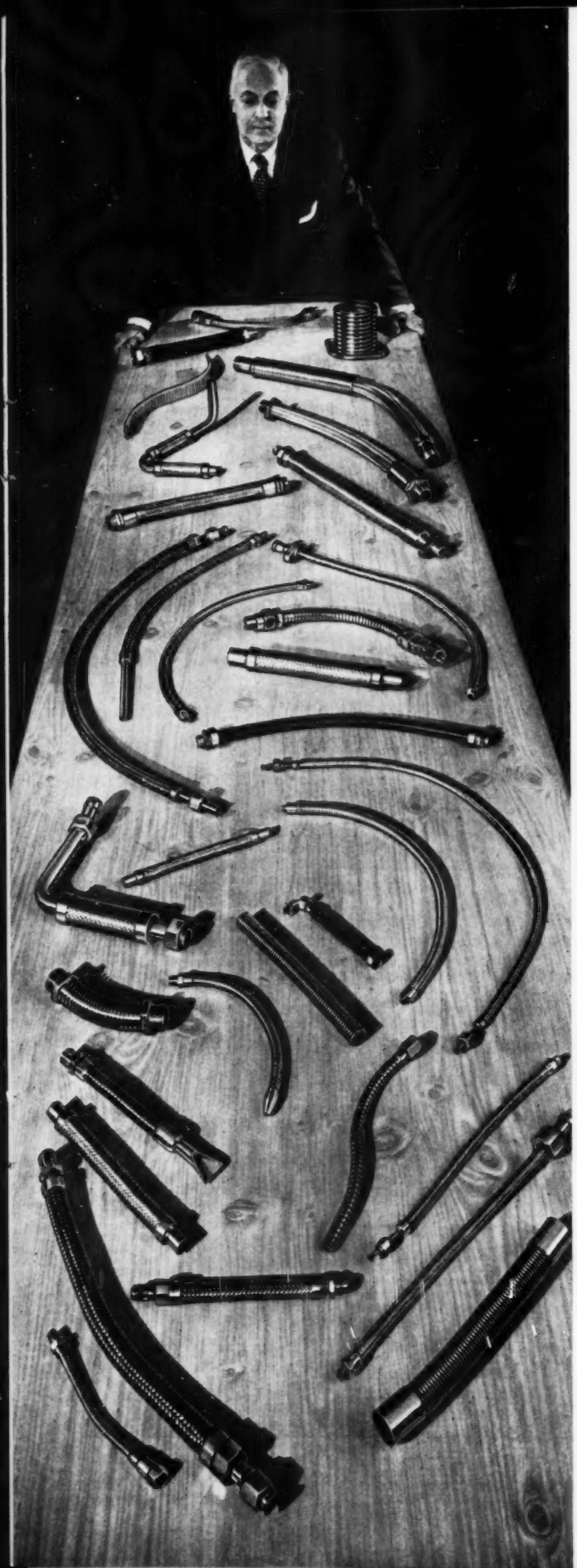
Seals and closures used with ball and roller bearings perform a dual function, that of retaining lubricant in the bearings and excluding foreign matter from them. The simpler and less severe the sealing problem, the simpler the seal that can be used. There are a number of forms of seals and closures used with ball and roller bearings. Some of the commonest types are shown in Fig. 14.

Designs A and C, Fig. 14, cover mechanical clearance seals that depend upon the lubricant in the clearances between the stationary and rotating members for effective sealing. These seals are suitable for use at low and moderate speeds where grease or grease products are used to lubricate the bearings. They do a fairly good job of sealing where sealing conditions are not too severe and some leakage can be tolerated.

Designs F and G, Fig. 14, illustrate sectional drawings of spring-loaded lip or unit type contact or rubbing type seals. These seals can be used to seal light, medium and heavy lubricants in bearings at low, medium and high speeds. Their efficiency depends to a great extent upon the smoothness and hardness of the shaft or part upon which they operate. Both of these seals have been used successfully in the automotive, tractor and aircraft industries where efficient and reliable sealing is needed. Design C, Fig. 14, shows a felt seal comprising a felt ring mounted in a cored or machined annular groove in a bearing end cover. Design D shows a sectional drawing of a felt seal held in an open groove with a removable retainer plate for easy replacement.

Designs F and G, Fig. 14, shows sectional drawings of spring-loaded unit or lip-type synthetic rubber and leather seals respectively. These seals were previously discussed in this paper under the topic of grease lubrication. On account of their unitary handling, small space requirements, and relatively low cost, these unit or lip-type seals have found wide usage in motor cars, tractors and general industrial applications. The trend in modern machine design is to operate machines at higher speeds and under heavier loads. This step necessitates the use of better bearings, better seals and better lubricants.

Because of the importance of trouble free performance demanded of both ball and roller bearings in modern mechanisms, the specification of the right bearings, the right seals, and the right lubricants for the job they have to do, deserves well informed and considered decisions.



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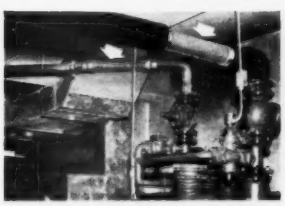

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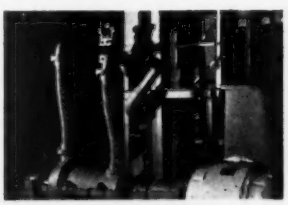

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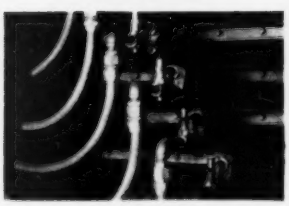

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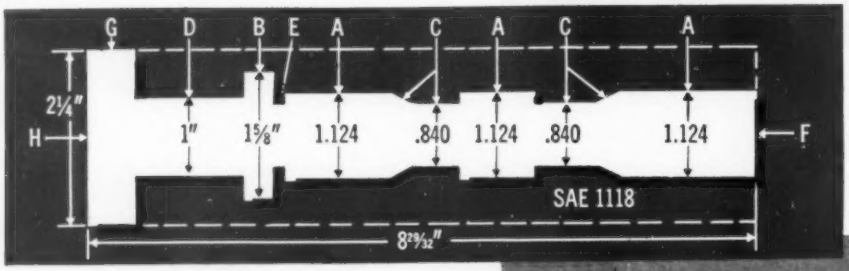
C. D. Form — 119 RPM — .0025" Feed
E. Face, shoulder, neck, undercut, HSS
F. Face 243 RPM — .0035" Feed
G. Knurl
H. Cut off — 243 RPM — .0035" Feed



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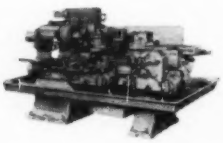

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141 **Specialized Instruments**—Company's specialized instruments and gages are described and illustrated in this bulletin. Includes equipment for measuring combustion, draft, pressure, flow, vacuum, temperature. F. W. Dwyer Mfg. Co.

142 **Optical Pyrometer**—Eight-pp Catalog 85 discusses principles of optical pyrometry and features of company's pyrometer, operating procedures and applications. The Pyrometer Instrument Co., Inc.

143 **For Metal Detection**—An electronic metal detector designed to indicate presence of any metal or alloy, magnetic or non magnetic, is described as to application and function in Catalog E. 42. Illustrates instrument, and some typical uses. Radio Corp. of America.

144 **Force-Balance Positioner**—Bulletin 473 describes the Poweractor, force-balance type positioner for cylinder-operated devices. Tells how this unit, designed for use with company's Stabiload cylinder, will position equipment requiring high power and long strokes, such as large size control valves and variable speed drives, through pneumatic cylinder (or springless diaphragm) operating mechanisms. Complete specifications given. Foxboro Co.

145 **Temperature Controller**—Bulletin P-811, 10 pp, introduces company's 077 electronic temperature controller, with range extended to cover -100 to 600 F. Contains specifications, prices and application information in two models, also data on resistance thermometer elements and wells, and control motors. Industrial Div., Minneapolis-Honeywell Regulator Co.

146 **Hot Water Controls** — Company's electronic controls for water heating systems are described in Bulletin F 6167, 8 pp. Discusses simple operation of electronic outdoor reset hot water controls; use of optional night depression with morning warm-up feature. Barber-Colman Co.

147 **Automatic Production Control**—Bulletin G-537, 24 pp, describes controls available on company's variable speed drives. Tells how to solve problems in control of tension, acceleration and deceleration, velocity and peripheral speed, synchronization of one or more machines, and maintenance of uniform temperature, liquid level, flow. Reeves Pulley Co.

BOILERS, BURNERS

148 **Boiler Reference Guide** — General Catalog 80, 32 pp, contains latest and most complete data on manufacturer's line of high and low pressure steel boilers for heating, power and process steam. Also includes descriptions of water heating products, both direct fired and storage types, as well as indirect water heating coils. Information on boiler support brackets, structural steel suspension and induced draft fans are also provided in this technical manual. Kewanee-Ross Corp.

149 **Steam Generators** — "Cyclonic combustion," a new method of heat transfer, is discussed in this bulletin. Descriptive drawings show how air is introduced into combustion chamber at high speeds in revolving spiral vortex, radiating heat to fire tube through direct radiation and convection. Cyclotherm.

150 **Oil and Gas Burner Equipment**—Bulletin OB-53, 28 pp, gives principles of selection and application of oil or gas burners, or a combination of both for standard and wide capacity range operation, together with air registers and heating, pumping sets. Conversion tables show relationships between quantity of oil burned, boiler capacity and air required for combustion. The Engineer Co.

February, 1954

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THIS MONTH'S LITERATURE OF MERIT deals with corrugated aluminum . . . electric heat . . . blast cleaning . . . fans . . . Dowtherm vaporizers

151 Aluminum Roofing, Siding—Corrugated aluminum roofing and siding as a long-lasting building material is described in 16-pp Bulletin 12C. Details and pictures methods of applying this roofing and siding, including use with self-tapping screws, Nelson Riv-weld studs and Widman fasteners. Such accessories as flashings, ridge roll and closure strip are described, and weight, loading and coverage data provided. Drawings show roofing and siding details on basic types of industrial structures, also construction details of an insulated industrial wall. Aluminum Co. of America.

152 Electric Heat, 101 Ways—Principal industrial heating applications and methods are described in, "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed along with a discussion of the problem, solution and advantages obtained. To illustrate liquid heating, diagrams and photos show best applications for the various types of elements and heaters. Similar treatment is accorded problems of heating air and gases; melting soft metals and viscous materials; and heating machinery and equipment parts. A section is devoted to far-infrared heating. Edwin L. Wiegand Co.

153 Blast Cleaning—Bulletin 1500, 30 pp, offers practical blast cleaning information such as: Where it can be used; how abrasive is forcibly propelled; types of surfaces to be cleaned; finish required in a specified time; price per piece cleaned. Gives various types of blast cleaning machines with specific uses. Includes list of applications and glossary of terms. Pangborn Corp.

154 Fan Engineering Data—Bulletin A-108, 166 pp, gives fan laws and formulas, terminology, and recommended velocities for exhaust hoods. Includes air pressure conversion table, charts on duct resistance, entrance losses and rectangular equivalent of round ducts. Discusses fan installation, maintenance and lubrication, also noise problems. Hartzell Propeller Fan Co.

155 Dowtherm Vaporizers — Bulletin A-100, 28 pp, describes Dowtherm vaporizers and heaters for high temperature, low pressure vapor and liquid phase process heating. Gives operating advantages and explains nine basic systems used for most Dowtherm heating jobs. Photos show 30 typical installations and a large cutaway shows design features of an automatic packaged horizontal vaporizer. Other units are pictured, specifications included. Eclipse Fuel Engineering Co.

WELDING AND MACHINE SHOP EQUIPMENT

156 Welding with Bronze—Bulletin W-17, 24 pp, describes company's line of products for use with metal-arc, carbon-arc, inert-gas tungsten-arc, submerged arc and inert-gas consumable electrode processes. Includes technical information on welding with bronze electrodes and filler rods, techniques and processes, recommended welding currents, machining. Also provides a weldability chart. Ampco Metal, Inc.

157 Valve Welding — Bulletin 507 lists socket welding and dimensions for valves 2 in. and smaller, and butt welding end, for pipes 2½ to 16 in., as approved by the American Welding Society. Diagrams show standard preparation of valve butt welding ends. Edward Valves, Inc.

158 Stranded Electrodes—Twelve-pp bulletin, "Stranded Electrode Materials for Aircomatic Welding," explains use of these wires in the inert-gas-shielded metal-arc consumable electrode rod Aircomatic welding process. Air Reduction Sales Co.

159 Decimal Equivalent Card—For toolchest or pocket reference, this red and black decimal equivalent chart (size 3⅜ in. by 5½ in.), lists decimal equivalents of fractional parts of an inch to six places. South Bend Lathe Works.

160 Machine Installation—Eight-pp bulletin answers questions on Unisorb machine mounting pads. Discusses elimination of bolt, reduction of transmitted machine vibration, relative cost. The Felters Co.

SAFETY, FIRE PROTECTION

161 Flame Failure Protection—"Guarding Your Property Against Flame Failure Explosions" is a non-technical explanation of the explosion danger inherent in fuel burning equipment. Shows how to make a safety survey to determine whether a burner is adequately protected against explosion. Combustion Control Corp.

162 Fire Pumps—Bulletin W-450-B42, on vertical turbine fire pumps, describes and gives specifications on these pumps designed for industrial installations. Shows how they provide an adequate defense for manufacturing and storage plants in areas where primary water supply is limited or where there is no municipal water supply. Worthington Corp.

163 For Fire Protection — Fire extinguishing systems and equipment are described in 20-pp illustrated Folio 1-1, along with an analysis of causes of extensive fire damage, and the need for specialized protection. Cites examples of adequate protection in typical industries and gives case histories showing how good fire-protection equipment averted serious fire damage. Cardox Corp.

LIGHTING, COMMUNICATION

164 Ceiling Lighting—Eleven major types of lighting equipment are described, along with structural drawings and illumination data, in 8-pp Catalog 54-S. Includes quick computation formulas for manufacturer's translucent ceilings. Discusses acoustical effectiveness of company's baffles, use of plenums as air diffusers. The F. W. Wakefield Brass Co.

165 Mobile Communication Equipment —Two new bulletins are available on the Carfone, a transmitter-receiver for two-way communication in the 152-174 mc band designed for installation in a vehicle. Catalog C.30 gives features and specifications for the 15-w Carfone, and Catalog C.3011 gives data on a 2½-w model. RCA Victor Div., Radio Corporation of America.

OTHER EQUIPMENT

166 Dock Shelters—Provided in this 20-pp pocket size booklet is detailed information on loading dock shelters and canvas "wall" curtains. A generously illustrated reference guide on the various types of these products, it covers uses, adaptations to specific needs. Atlas Industries, Inc.

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140 Modern Counters—Counting instruments for a wide range of purposes are described and pictured in 8-pp Catalog 54A. Stroke, revolution, coil winding counters and photo-electric counting units are listed, also mercury electric counters and automatic batch counters. Includes application suggestions, prices. Production Instrument Co.

141 Specialized Instruments—Company's specialized instruments and gages are described and illustrated in this bulletin. Includes equipment for measuring combustion, draft, pressure, flow, vacuum, temperature. F. W. Dwyer Mfg. Co.

142 Optical Pyrometer—Eight-pp Catalog 85 discusses principles of optical pyrometry and features of company's pyrometer, operating procedures and applications. The Pyrometer Instrument Co., Inc.

143 For Metal Detection—An electronic metal detector designed to indicate presence of any metal or alloy, magnetic or non magnetic, is described as to application and function in Catalog E.42. Illustrates instrument, and some typical uses. Radio Corp. of America.

144 Force-Balance Positioner — Bulletin 473 describes the Poweractor, force-balance type positioner for cylinder-operated devices. Tells how this unit, designed for use with company's Stabiload cylinder, will position equipment requiring high power and long strokes, such as large size control valves and variable speed drives, through pneumatic cylinder (or springless diaphragm) operating mechanisms. Complete specifications given. Foxboro Co.

145 Temperature Controller—Bulletin P-811, 10 pp, introduces company's 077 electronic temperature controller, with range extended to cover -100 to 600 F. Contains specifications, prices and application information in two models, also data on resistance thermometer elements and wells, and control motors. Industrial Div., Minneapolis-Honeywell Regulator Co.

146 Hot Water Controls — Company's electronic controls for water heating systems are described in Bulletin F 6167, 8 pp. Discusses simple operation of electronic outdoor reset hot water controls; use of optional night depression with morning warm-up feature. Barber-Colman Co.

147 Automatic Production Control—Bulletin G-537, 24 pp, describes controls available on company's variable speed drives. Tells how to solve problems in control of tension, acceleration and deceleration, velocity and peripheral speed, synchronization of one or more machines, and maintenance of uniform temperature, liquid level, flow. Reeves Pulley Co.

BOILERS, BURNERS

148 Boiler Reference Guide — General Catalog 80, 32 pp, contains latest and most complete data on manufacturer's line of high and low pressure steel boilers for heating, power and process steam. Also includes descriptions of water heating products, both direct fired and storage types, as well as indirect water heating coils. Information on boiler support brackets, structural steel suspension and induced draft fans are also provided in this technical manual. Kewanee-Ross Corp.

149 Steam Generators — "Cyclonic combustion," a new method of heat transfer, is discussed in this bulletin. Descriptive drawings show how air is introduced into combustion chamber at high speeds in revolving spiral vortex, radiating heat to fire tube through direct radiation and convection. Cyclotherm.

150 Oil and Gas Burner Equipment—Bulletin OB-53, 28 pp, gives principles of selection and application of oil or gas burners, or a combination of both for standard and wide capacity range operation, together with air registers and heating, pumping sets. Conversion tables show relationships between quantity of oil burned, boiler capacity and air required for combustion. The Engineer Co.

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THIS MONTH'S LITERATURE OF MERIT deals with corrugated aluminum . . . electric heat . . . blast cleaning . . . fans . . . Dowtherm vaporizers

151 Aluminum Roofing, Siding—Corrugated aluminum roofing and siding as a long-lasting building material is described in 16-pp Bulletin 12C. Details and pictures methods of applying this roofing and siding, including use with self-tapping screws, Nelson Bivweld studs and Widman fasteners. Such accessories as flashings, ridge roll and closure strip are described, and weight, loading and coverage data provided. Drawings show roofing and siding details on basic types of industrial structures, also construction details of an insulated industrial wall. Aluminum Co. of America.

152 Electric Heat, 101 Ways—Principal industrial heating applications and methods are described in, "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed along with a discussion of the problem, solution and advantages obtained. To illustrate liquid heating, diagrams and photos show best applications for the various types of elements and heaters. Similar treatment is accorded problems of heating air and gases; melting soft metals and viscous materials; and heating machinery and equipment parts. A section is devoted to far-infrared heating. Edwin L. Wiegand Co.

153 Blast Cleaning—Bulletin 1500, 30 pp, offers practical blast cleaning information such as: Where it can be used; how abrasive is forcibly propelled; types of surfaces to be cleaned; finish required in a specified time; price per piece cleaned. Gives various types of blast cleaning machines with specific uses. Includes list of applications and glossary of terms. Pangborn Corp.

154 Fan Engineering Data—Bulletin A-108, 166 pp, gives fan laws and formulas, terminology, and recommended velocities for exhaust hoods. Includes air pressure conversion table, charts on dust resistance, entrance losses and rectangular equivalent of round ducts. Discusses fan installation, maintenance and lubrication, also noise problems. Hartzell Propeller Fan Co.

155 Dowtherm Vaporizers — Bulletin A-100, 28 pp, describes Dowtherm vaporizers and heaters for high temperature, low pressure vapor and liquid phase process heating. Gives operating advantages and explains nine basic systems used for most Dowtherm heating jobs. Photos show 30 typical installations and a large cutaway shows design features of an automatic packaged horizontal vaporizer. Other units are pictured, specifications included. Eclipse Fuel Engineering Co.

WELDING AND MACHINE SHOP EQUIPMENT

156 Welding with Bronze—Bulletin W-17, 24 pp, describes company's line of products for use with metal-arc, carbon-arc, inert-gas tungsten-arc, submerged arc and inert-gas consumable electrode processes. Includes technical information on welding with bronze electrodes and filler rods, techniques and processes, recommended welding currents, machining. Also provides a weldability chart. Ampco Metal, Inc.

157 Valve Welding — Bulletin 507 lists socket welding and dimensions for valves 2 in. and smaller, and butt welding end, for pipes 2½ to 16 in., as approved by the American Welding Society. Diagrams show standard preparation of valve butt welding ends. Edward Valves, Inc.

158 Stranded Electrodes—Twelve-pp bulletin, "Stranded Electrode Materials for Aircomatic Welding," explains use of these wires in the inert-gas-shielded metal-arc consumable electrode rod Aircomatic welding process. Air Reduction Sales Co.

159 Decimal Equivalent Card—For toolchest or pocket reference, this red and black decimal equivalent chart (size 3⅜ in. by 5½ in.), lists decimal equivalents of fractional parts of an inch to six places. South Bend Lathe Works.

160 Machine Installation—Eight-pp bulletin answers questions on Unisorb machine mounting pads. Discusses elimination of bolt, reduction of transmitted machine vibration, relative cost. The Felters Co.

SAFETY, FIRE PROTECTION

161 Flame Failure Protection—"Guarding Your Property Against Flame Failure Explosions" is a non-technical explanation of the explosion danger inherent in fuel burning equipment. Shows how to make a safety survey to determine whether a burner is adequately protected against explosion. Combustion Control Corp.

162 Fire Pumps—Bulletin W-450-B42, on vertical turbine fire pumps, describes and gives specifications on these pumps designed for industrial installations. Shows how they provide an adequate defense for manufacturing and storage plants in areas where primary water supply is limited or where there is no municipal water supply. Worthington Corp.

163 For Fire Protection — Fire extinguishing systems and equipment are described in 20-pp illustrated Folio 1-1, along with an analysis of causes of extensive fire damage, and the need for specialized protection. Cites examples of adequate protection in typical industries and gives case histories showing how good fire-protection equipment averted serious fire damage. Cardox Corp.

LIGHTING, COMMUNICATION

164 Ceiling Lighting—Eleven major types of lighting equipment are described, along with structural drawings and illumination data, in 8-pp Catalog 54-S. Includes quick computation formulas for manufacturer's translucent ceilings. Discusses acoustical effectiveness of company's baffles, use of plenums as air diffusers. The F. W. Wakefield Brass Co.

165 Mobile Communication Equipment —Two new bulletins are available on the Carfone, a transmitter-receiver for two-way communication in the 152-174 mc band designed for installation in a vehicle. Catalog C.30 gives features and specifications for the 15-w Carfone, and Catalog C.3011 gives data on a 30-w model. RCA Victor Div., Radio Corporation of America.

OTHER EQUIPMENT

166 Dock Shelters—Provided in this 20-pp pocket size booklet is detailed information on loading dock shelters and canvas "wall" curtains. A generously illustrated reference guide on the various types of these products, it covers uses, adaptations to specific needs. Atlas Industries, Inc.

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167 For Liquid Cleaning—Illustrated 20-pp Bulletin 2240B describes applications, principles of operation and design features of company's precipitator, which manufacturers claim remove impurities efficiently from a liquid by precipitation, adsorption, settling and filtration. Includes floor diagrams and specifications. The Permutit Co.

168 Tumbling Barrels—Catalog B-9, 12 pp, describes horizontal and tilting-type tumbling barrels. Special features, such as "work shifting" bottoms, are illustrated. Also covered is a new flask-type tilting barrel. Barrels described are for deburring, burnishing, or polishing, or combination use. Charts show capacities, speeds and types of tumbling media and their applications are listed. The Globe Stamping Div., Hupp Corp.

169 To Cut Production Costs—A 78-pp booklet, Bulletin PG 5360, is company's second volume of case studies on cutting production costs with electronic and photoelectric controls. The 46 studies presented cover use of the controls in automatic machinery, materials handling, metal working, packaging, food processing and many other applications. They cover such operations as liquid control, counting, sorting, jam detection, smoke detection, operator protection, door opening. Photoswitch, Inc.

170 Pressure-Leaf Filters—Catalog NC-1-53, 20 pp, fully illustrated, describes company's Niagara pressure-leaf horizontal and vertical filters for liquid clarification and solids recovery, including new type "H" horizontal filter. Diagrams and charts show operation, sizes, capacities. Discusses time and money savings from use of filter. Niagara Filters Div., American Machine and Metals, Inc.

171 Oil Cooling Equipment — Catalog FB-1052, 20 pp, discusses controlled quench oil cooling for uniform quality in heat-treated metals. Describes and illustrates typical installations of coolers; tells how to select cooling systems; and gives circulation rates. Charts show oil recirculation for batch quenching, determination of amounts of oil required. Illustrates accessories including Kleen-Well oil strainers, "Perambulator" oil coolers, junior quencher, centrifugal pumps. Bell & Gossett Co.

172 Fluid Power Equipment—Twelve-pp illustrated Bulletin 10051-C describes company's complete line of fluid power pumps, motors, transmissions, cylinders and valves. Features variable and constant delivery pumps for operation at higher speeds, small (1 hp) variable delivery pumps, constant delivery duplex variety for pressures up to 5000 psi, and a larger capacity feed pump. The Oilgear Co.

173 Formed Wire Products — Turnbuckles, eyebolts, U-bolts, screw eyes and lag screws, S and 8 hooks, screw hooks and others are catalogued in Form 482, 16 pp. Fully illustrated, includes specifications, prices. Round Chain Companies.

174 Dust Collection—Aerodyne dust collectors in chemical processing and other industries are discussed in 8-pp Bulletin 171. Explains theory and design of collector system; includes drawings of types. The Green Fuel Economizer Co., Inc.

175 Boiler Water Sample Cooler—Bulletin 110 gives design specifications of company's boiler water sample cooler No. 75, and charts to determine cooling water flow rate for various sample temperatures. Includes typical piping hookups, installation and operation instructions. Davis Engineering Corp.

176 Noise Suppression Filters—High reliability noise suppression filters of high current ratings and high attenuation, in hermetically-sealed metal cases, are discussed in Bulletin FS53. Lists seven filter types with dimensions and drawings, electrical factors, attenuation curves and approximate weights. Aerox Corp.

177 Protective-Atmosphere Furnaces—Twenty-pp Bulletin GER-811, "How to Cure Protective Atmosphere Troubles," discusses impurities causing furnace troubles, tests for oxidation and discoloration, furnace leaks. Tells how to take gas samples for analysis. Includes check sheet for troubles and cures. General Electric Co.

DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 37-38 and 167-168

DUST CONTROL

201 Dust Control Technology—Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists basic methods of dust control and analyzes elements of exhaust systems. Pangborn Corp.

202 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

203 Dust Control—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

204 Dust and Fume Eliminators—Catalog 482, 12 pp, describes company's Centri-Merge dust and fume eliminators, explaining advantages of the swirl action incorporated. Illustrations include photos of installations, and dimensional drawings of units with capacities ranging from 400 cfm up to 5000 to 30,000 cfm. Schmieg Industries, Inc.

VIBRATION CONTROL

205 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discusses advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended methods of isolation. The Korfund Co.

206 Simplified Isolation—A simplified method of machine isolation which utilizes pads and cement is described in this small folder. Explains how it reduces maintenance cost. The Felters Co.

VENTILATING AND AIR CONDITIONING

207 Air Conditioning Cabinets—Engineering Bulletin 3703A, 40 pp, describes and illustrates manufacturer's Model G cabinets, central units available in both horizontal and vertical models, providing 875 to 22,000 cfm and offering combinations for any function or functions of air conditioning. Booklet gives construction details, discusses heating and cooling coils. Buffalo Forge Co.

208 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

209 Push-Button Ventilation—Six-pp Bulletin 680 gives sizes, dimensions and performance data on power roof ventilators for flat, curved or peak roof installations, capacities to 78,800 cfm. Cites advantages of ventilation by positive air displacement. Propellair Div., Robbins & Myers, Inc.

VALVES, TRAPS, PIPING AND ACCESSORIES

210 For Quick Valve Selection—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

211 Bronze Valves—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

212 Valve Maintenance Guide—"Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented. Discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

213 Automatic Valves—Pressure, flow, and liquid level controls for steam, air, gas and fluids are shown in 90-pp Catalog A-50. Includes sizes, prices, capacity charts, conversion tables. Davis Regulator Co.

214 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and properties of saturated steam included. Yarnall-Waring Co.

215 Solving Steam Trap Problems—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Gives pointers on how to install traps and service them. The V. D. Anderson Co.

216 Steel Unions—This catalog sheet describes and pictures several types of steel unions, telling applications of each and listing sizes, prices. Clayton Mark & Co.

217 Welding Fittings—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section. Bonney Forge & Tool Works.

218 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

219 Handbook on Fittings, Flanges—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

220 Packless Expansion Joints—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

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DATA FILE

(Begins on page 169)

221 Pipe Insulation—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between -300 and 800 F. Listing of physical properties and condensed specifications is included. Pittsburgh Corning Corp.

222 Pipe Fabricating Service—This bulletin describes a fabricating service designed to save time, material and labor in piping systems. All types of materials can be fabricated. Naylor Pipe Co.

223 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

224 Wrought Iron for Piping—This 32-pp booklet covers commonly used pipe materials and method of selecting them for specific types of service in modern building construction. Discusses wrought iron, cast iron and steel pipe, also copper and brass pipe, and the factors entering into the relative costs of piping materials. Pipe selection is treated, with emphasis on corrosion resistance. A. M. Byers Co.

INSTRUMENTS, CONTROLS

225 For Liquids Worth Storing—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

226 Wide Range Regulator—Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

Postage free cards for ordering these catalogs are on pages 37 and 167. When using them, don't forget to include your job title and company name—even if you want those catalogs to be delivered to your home address

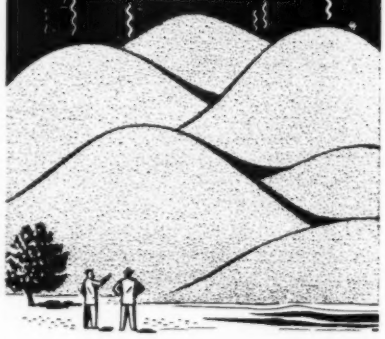
227 Gages for Many Jobs—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. United States Gauge Div., American Machine and Metals, Inc.

228 Electrical Instruments—A line of instruments for production testing, plant maintenance and service is shown in 16-pp Bulletin A-16-B. Among these are a-c clamp volt ammeters and a-c clamp ammeters, circuit testers, analyzers, mutual conductance tubechecker, pocket-size meters. Weston Electrical Instrument Corp.

229 Orifice Meters—Bulletin 1050 Rev. 1, 28 pp, shows how manufacturer's orifice meters are made, how they operate. Tables give capacity data, and there are descriptions of manifold arrangements and differential ranges, along with illustrations of various parts. Sketches show how meters are used. Rockwell Mfg. Co.

230 Electronic Controls—Eight-pp Catalog F 6166 describes flexibility of an elec-

The belt that moved mountains of hot sand



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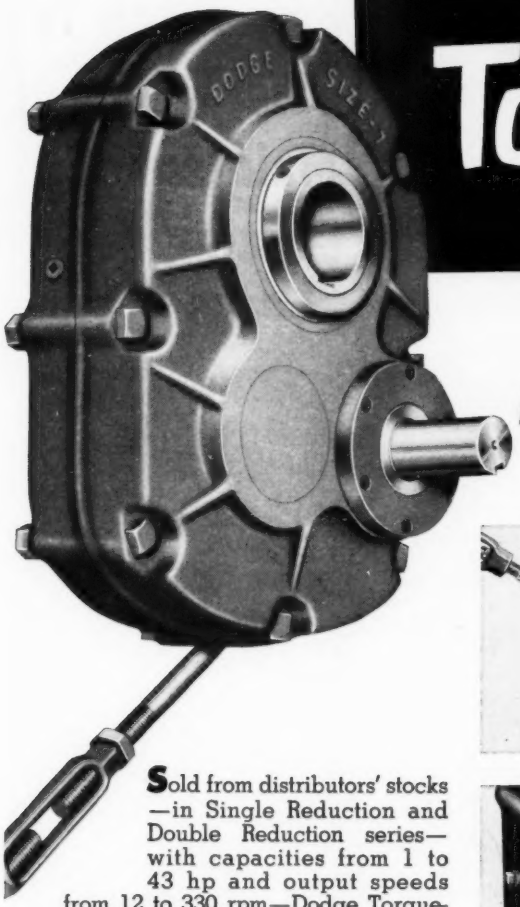

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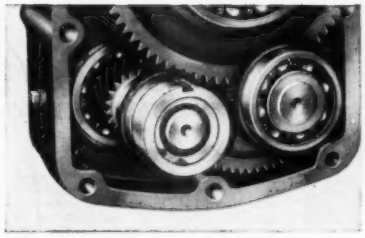

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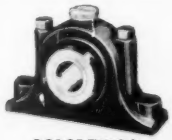
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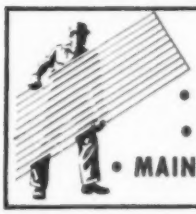

WHY?

- LOWEST COST
- BETTER LIGHT
- MAINTENANCE FREE

Skylights of Resolite are installed at half the cost of conventional glazing because Resolite nests with all standard corrugations; requires no framing or flashing. It rests on the same members, is fastened the same way as the metal sheets. Sidewall lights of Resolite in non-corrugated construction need no expensive sash, simple angle girts give full support.

Shatterproof, structurally rugged, inert to usual industrial fumes, Resolite has unlimited life without protective treatment or maintenance. It is a quality product composed of stable polyester resins, reinforced with a *two-ounce* Fiberglas mat. It can be sawed, nailed, bolted and installed with ordinary tools by unskilled workers.

Flat sheets for sash are factory-cut to size. They are installed like glass.

The pictures above show the even distribution of daylight obtained in a building skylighted and glazed with Resolite. Its diffused light gives workers greater visual comfort . . . cuts artificial light costs. See why more and more nationally known industries are using Resolite for modern plant daylighting.

Send for New Industrial Skylighting Folder and Name of Nearest Distributor

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For more facts circle 621 on Reply Card

DATA FILE

(Begins on page 169)

tronic control system for heating, ventilating and air conditioning. Describes temperature controls, control panel, sensing elements, as well as the ultra-sensitive micro relay which simplifies the amplifier. Barber-Colman Co.

231 Door Operators—This catalog covers electronic operators for opening, closing and locking doors and gates for a wide range of industrial and special applications, friction drive or chain drive. Robot Appliances, Inc.

LIGHTING, COMMUNICATION

232 How to Use Sound Signals—This new 44-pp combination manual, data book and catalog is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a code signal call system. Benjamin Electric Mfg. Co.

233 Precision Lamps—Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Flood, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

234 Lighting Fixtures—New Section K of Condulet Catalog 3000 describes components, performance data, and methods of relamping for any of the manufacturer's new EV series explosion-proof and weather resistant lighting fixtures. It contains illustrations showing steps for easiest relamping and installation of this type of fixture. Crouse-Hinds Co.

236 Adjustable Lighting Units—Bulletin 134, 8 pp, describes and pictures lights with spring-tension sockets and swivels. Covers both fluorescent and incandescent units, including Coolite incandescent lights with metal shades designed to remain comfortable to the touch. Gives suggestions for use, dimensions, prices. Swivelier Co., Inc.

ELECTRICAL

237 Motor-Generator Reference Book—Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their application and operating requirements. Booklet is generously illustrated and includes performance data, ratings, information on methods of speed control. Allis-Chalmers Mfg. Co.

238 Motor Handbook—Bulletin MU-185 provides 6 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Wagner Electric Corp.

239 Small Bus Duct—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also trap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

240 Productive Maintenance—Publication GED-1691 is a pocket-size 104-pp source of information of value to plant engineers who want to get more production from their present motors, generators and control equipment. Besides general maintenance suggestions, the booklet contains trouble shooting charts and recommended renewal parts guides. Also provides wire and cable data and includes a section of formulas and other data pertaining to motors and generators. General Electric Co.

241 The Answers on Wiring—"20 Questions and 20 Answers on Safety m.i. Wiring"

How Much Is Washroom Maintenance Costing *YOU?*

$79.30 Per Year
Towel cost saved by restaurant!
$361.00 Per Year
Cost of towels saved by a manufacturer!
$171.00 Per Year
Towel costs eliminated in typical high school!

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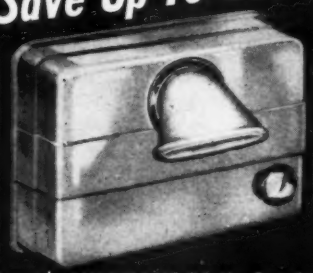
Save Up To 85%



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Take a practical look at your own washrooms . . . the expense of towels required over a year . . . janitor time required to fill empty towel cabinets and empty waste containers . . . clean up towel litter. At best, towel service is as good as its maintenance . . . and that maintenance is an overhead expense costing you money!

New Sani-Driers eliminate ALL this needless expense! They provide fast, efficient hand or hair drying service 'round the clock . . . *quickly pay for themselves out of savings!* Approved by Underwriter's Laboratories.

Write for new illustrated literature! Semi-recessed model shown above. Wall and pedestal models also available.

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"Dependable Since 1897"
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It's a good thing for you that Mrs. MacTavish was on the school board

The plans for the new school building were all completed and were now being shown to the Board.

"And why," asked Mrs. MacTavish, "should the new building burn oil instead of coal?"

"Well," explained the architect very patiently, "oil saves labor."

"So does a stoker!" snapped Mrs. MacTavish.

"And oil is clean."

"No cleaner than coal if you use the right grade and burn it right. What's more, you can always get coal and maybe you can't get oil. Remember how the schools over at Jamestown had to shut down for weeks at a time during the war because they couldn't get oil?"

"Anything else, Mrs. MacT?"

"Indeed there is. I always save my big reason till the last. Coal's a sight cheaper."

"Oh now, Mrs. MacT., I don't think there is so much difference."

"When it comes to spending money, I don't want to think – I want to know. The Chesapeake and Ohio Railway has a combustion engineering service – absolutely free, mind you. Let's get their man to come in and give us facts – not opinions."

The C&O combustion engineer's carefully documented survey proved beyond doubt that coal would not only save several thousand dollars a year in fuel cost, but that the installation itself would be cheaper.

"There should be a Scot on every civic board," snapped Mrs. MacTavish. "We're the only people left who seem to care a hoot about the taxpayer's pocketbook."

Bring your fuel problems to C & O

As the world's largest carrier of bituminous coal, the C&O is intimately familiar with every phase of coal use. We have a large staff of experts who will gladly help you to locate the coal best suited to your needs; to help you use it most efficiently; to help get it to you promptly.

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COAL...FUEL OF THE FUTURE

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OPEN – CLOSE – LOCK: DOORS, GATES

★ INDUSTRIAL
★ COMMERCIAL
★ RESIDENTIAL
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MODELS AVAILABLE TO OPERATE THE FOLLOWING DOORS, GATES, ETC.

FRICTION DRIVE or CHAIN DRIVE

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In addition to applications illustrated, ROBOT Operators will also operate the following:

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And any other applications where a safe and dependable automatic electric power unit is desired for operators requiring a reversing travel cycle — or an intermittent cycle in one direction.

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DATA FILE

(Begins on page 169)

describes and illustrates characteristics and advantages of this new wiring system. A complete table of types, sizes, weights and lengths, as well as a partial list of users included. General Cable Corp.

242 Bus Duct Manual—Booklet B-4272A 68 pp. on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct or a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

243 Power Distribution Feeders—Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution system, gives construction engineering, application data. Trumbull Dept., General Electric Co.

244 Handbook on Storage Batteries—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

245 Air-Cooled Transformers—Eight-pp Bulletin 153-A describes air-cooled dry-type transformers, stressing their advantages and listing typical applications. Illustrates, and gives construction details and specifications for standard types. Also pictures some special transformers and reactors. Sorgel Electric Co.

246 Circuit Breaker Reference Data—Catalog Section 5000 is a collection of more than 30 data sheets providing selection and application information and ordering instructions for company's molded case circuit breakers. Fully illustrated, includes ratings, current carrying capacities, dimensions, prices. I-T-E Circuit Breaker Co.

247 FHP Manual Starters—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual. Lists applications for these starters and pictures enclosures. Square D Co.

248 Snap Action Switches—Catalog 82, 23 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing. Micro Div., Minneapolis-Honeywell Regulator Co.

249 Electrical Equipment for Cranes—A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated. Overhead Crane Div., Harnischfeger Corp.

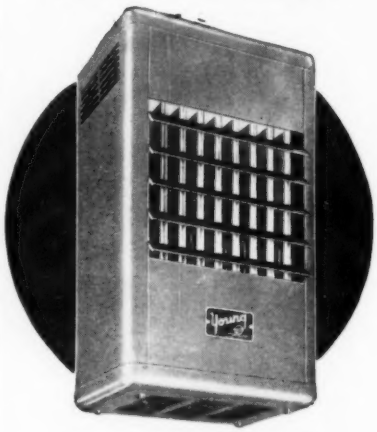
250 Flexible Cords—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

251 Retractile Cords—This 8-pp bulletin presents retractile cords for general communication and power applications. Containing catalog data and ordering information as well as application photos, explains how the cords are made, where used, advantages. Koiled Kords, Inc.

252 Cartridge Fuses—Form S-60, 12 pp, covers dual-element cartridge fuses designed to offer greater protection on electrical circuits. Shows design and construc-

YOUNG

GAS-FIRED UNIT HEATERS



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ALUMINIZED STEEL COMBUSTION CHAMBER AND HEAT EXCHANGER

- Corrosion-resistant Heat Exchanger is one-piece welded aluminized steel construction with interchanger tubes dimpled to stop warmup noises.
- Non-corrosive aluminized steel Combustion Chamber and Exchanger are welded into a single, leakproof assembly.
- Aluminum four-bladed propeller type fan is accurately formed and balanced to deliver maximum volume of air quietly.

Designed for all-around heating comfort and maximum fuel economy. Young Gas-Fired Unit Heaters are available in eight popular sizes, ranging in capacities from 50,000 to 230,000 Btu/hr input. These lightweight, modern Gas Unit Heaters feature all-welded, corrosion-resistant aluminized steel Combustion Chamber and Heat Exchanger.

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WISSCO BELTS
improved
FOR BETTER SERVICE...
TOUGHER JOBS
New and improved features incorporated into the construction of Wissco Belts combine to make them even more dependable and efficient than ever before.
DUAL CONTINUOUS REINFORCING ROD
PERMANENT KNUCKLED EDGE
STRETCH AND DISTORTION RESISTANT SPIRALS
QUICK SPLICE CONNECTOR
These are exclusive improvements that mean better service from Wissco Belts. Wissco Belts made from ¼" rods now handle heavy duty high temperature jobs previously considered too tough for alloy belts.
Let us know your requirements. Improved heavy duty Wissco Belts are supplied in all high temperature alloys.
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Here is a special fabricating service designed to save time, material and labor in piping systems. By eliminating numerous flanged joints and combining several fittings into one integral unit, as illustrated, Naylor fabrications provide the answer for greater efficiency and economy.

All types of materials can be fabricated accurately to your specifications. Sizes range from 3" to 44" in diameter and wall thicknesses up to ⅜".

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DATA FILE

(Begins on page 169)

tion of both ferrule-type and knife-blade type fuses. Lists benefits provided. Economy Fuse & Mfg. Co.

WIRE ROPE, SLINGS

253 To Keep Wire Rope at Work—Form 3547 is an 82-pp handbook titled "Here's How to Keep Your Wire Rope Working," and filled with practical tips on care and use of wire rope. Tells how wire rope is constructed, what types are suited to various jobs, how to install it. Covers such subjects as abrasion, lubrication, avoiding kinks, alignment of sheaves, winding on drums, bending fatigue, wire breaks, when to discard a wire rope. Wire Rope Divs., American Chain & Cable Co., Inc.

254 Wire Rope, How to Use It—Practical information on the use and care of wire rope is given in 72-pp pocket-size Catalog C-51. Covers unloading, storing, kinking, unreeling, installing, breaking in, methods of seizing and cutting, measuring, end preparations, many other pertinent factors. Fully illustrated with photos and sketches, treats splicing in detail and includes chapter on lubrication. Also presents data on wire rope constructions, efficiencies of fittings. Available to qualified plant engineers. A. Leschen & Sons Rope Co.

255 Sling Handbook and Riggers Manual—In the sling handbook section of this 48-pp book, 11 sling types are illustrated and their dimensions, weights and safe working loads given. Illustrations of sling uses accompany factual data. Also pictured and detailed are sling fittings. Information on care of slings, data on braided wire fabric and directions on splicing braided wire sling fabric included. The riggers manual gives detailed instruction on splicing, and includes data on efficiencies of wire rope attachments and directions for attaching sockets or ferrules. Shows signals for cranes. Union Wire Rope Co.

256 Slings for Industry—Form 5308 is a compact reference bulletin packed full of sling data. Lists slings of approximate breaking strengths of 1000 lb to 243.4 tons, along with their safe loads for various angles of use. Macwhyte Co.

MECHANICAL POWER TRANSMISSION

257 Variable Speed Control Simplified—Bulletin 700 contains some 40 pp of descriptive application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient variable speed control. Lovejoy Flexible Coupling Co.

258 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

259 Power Drive Handbook—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

260 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

261 Sprockets, Roller Chain—Bulletin A-624, 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. A page devoted to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cottered-type roller chains. Dodge Mfg. Co.

Large or small jobs—

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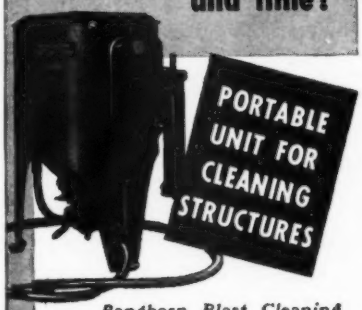
cuts maintenance cost and time!



Pangborn Blast Cleaning Machine—Cleans tanks, bridges, buildings, and other structures quickly and economically. Ideal for maintenance and other jobs, such as removal of dirt, scale, rust, etc. preparatory to painting. Six sizes, stationary or portable, from . . . **$188** and up..

Pangborn Blast Cabinet—Saves time and money in cleaning small metal parts . . . removing rust, scale, grime, old paint, etc. Produces smooth, clean surfaces on pieces up to 60" x 35" in size. Models from . . . **$319** and up.

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Pangborn
BLAST CLEANS CHEAPER
with the right equipment for every job

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for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

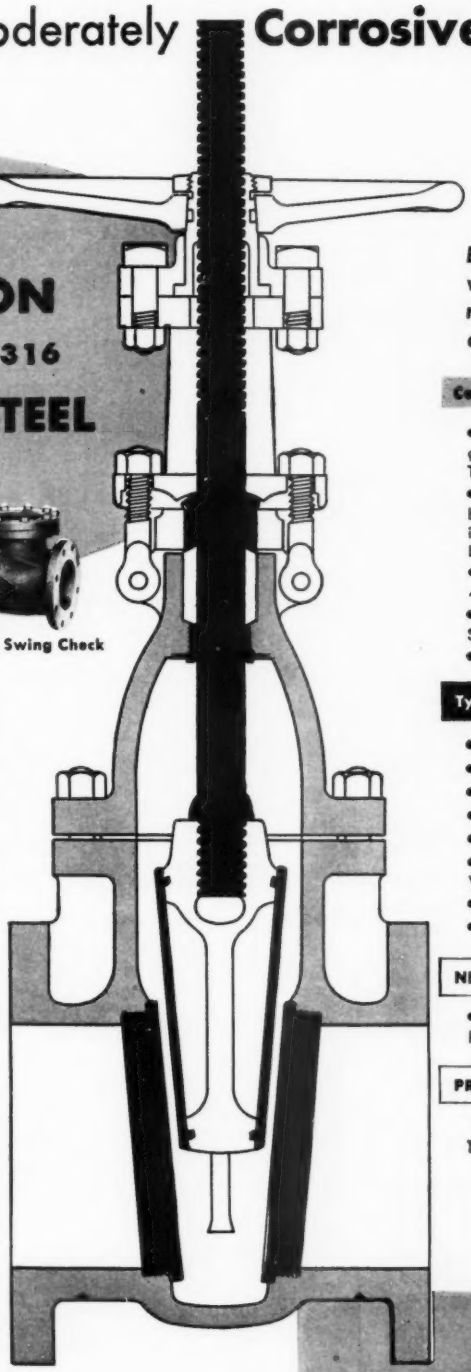
NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

Fig. 2624 Swing Check



Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2" to 4" sizes.
- **WEDGE** In 10" to 24" sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10" to 24" sizes.
- SEAT RINGS
- DISC and HANGER in Gate Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2" to 8" sizes.

PRESSURE RATINGS

2" to 12"—200 lbs. O.W.G.
14" to 24"—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

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JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

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GRAPHALLOY materials are also in wide use for oil-free, self-lubricating piston rings, seal rings, thrust washers, friction discs, pump vanes, etc.

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For applications requiring low electrical noise, low and constant drop, high current density and minimum wear. Used for SELSYNS, DYNAMOTORS, SYNCHROS, ROTATING STRAIN GAGE pick-ups and many other applications. Brush Holders and Coin Silver Slip Rings also available.

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DATA FILE

(Begins on page 169)

262 Chart on Belt Care—In the interest of conserving power transmission belting, this manufacturer offers cardboard wall chart on the care and maintenance of power driven belts. Carries sketches and brief text covering the steps to be taken to select the right belt, install it, use it correctly and keep it in good operating condition. Cling-Surface Co.

263 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail, along with dimensional data. Includes standards for bore specifications. Thomas Flexible Coupling Co.

264 Brakes and Brake Motors—Construction advantages of company's brakes are featured in illustrated Bulletin SL-610-1 on brakes and brake motors. Dimensions, mechanical and electrical characteristics. Crocker-Wheeler Div., Elliott Co.

HEATING, COOLING

266 Buying a Portable Heater?—Stressing safety factors involved, this 40-pp booklet, "Guide to the Selection and Use of Portable Space Heaters," analyzes temporary heating equipment from standpoints of personnel well being, property protection and fire and accident prevention. Classifies basic types of direct- and indirect-fired portable heating devices, giving their advantages and limitations. Provides a guide for evaluating portable heaters in terms of design, construction, operation and safety. Herman Nelson Div., American Air Filter Co., Inc.

267 Engineering Data for Heating Systems—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed, illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

268 Heat Exchangers, Storage Heaters—Sixteen-pp Catalog 5 covers more than a dozen types of hot water storage heaters and heat exchangers, including horizontal and vertical hot water storage heaters, instantaneous water heaters, convertors, condensate coolers. Tables assist in selecting correct equipment for given operating condition. Patterson-Kelley Co., Inc.

269 Electric Heaters—Bulletin E-1, 8 pp, describes electric unit heaters and heater sections for general industrial heating as well as for specialized use in heating corners of factories, warehouses. Illustrates overhead downward discharge heaters with revolving and stationary discharge outlets and a heater with horizontal discharge. An electric duct heater section is also described. L. J. Wing Mfg. Co.

270 Forced Air Space Heaters—Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principle and flexibility of application. Dravo Corp.

271 What Unit Heaters Can Do—Featuring many photos showing how unit heaters are being used to provide heating comfort, cut fuel costs, provide economical air circulation, 8-pp Bulletin 149-A discusses advantages of these heaters and gives performance data. Modine Mfg. Co.

272 Gas Unit Heater—Bulletin B-1710A introduces a line of gas unit heaters for automatic controlled heating. Stresses clean heat provided, low installation cost, wide range of gases which may be burned, other advantages of the units available in

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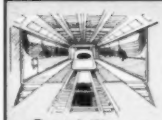
Schmieg CENTRI MERGE
INDUSTRIAL EQUIPMENT

Schmieg DUST and FUME CONTROL EQUIPMENT

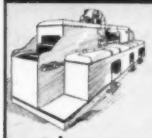
Completely automatic Centri-Merge units are designed and engineered to your specific requirements, to maintain the cleanest dust- and fume-free working conditions. Compact, self-contained equipment occupies a minimum of valuable floor space, saves on upkeep.

Schmieg SPRAY BOOTHS



Designed, built and installed to synchronize with your production line. No fire hazard with a Centri-Merge; overspray carried away in a whirling tornado of water. Safe, clean, efficient, economical; adapted to any conveyor equipment, overhead or floor.

Schmieg MECHANICAL WASHERS



Centri-Merge is first step and first choice of plant engineers for high production cleaning, long trouble-free service at low operating cost. Convenient manual or automatic types for any finishing application.

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Safeguard your product quality with Schmieg drying and baking-ovens. Every operating essential carefully designed and engineered to give you the very best finishing job. Any size, shape or type of oven, conveyor or box, for any installation arrangement.

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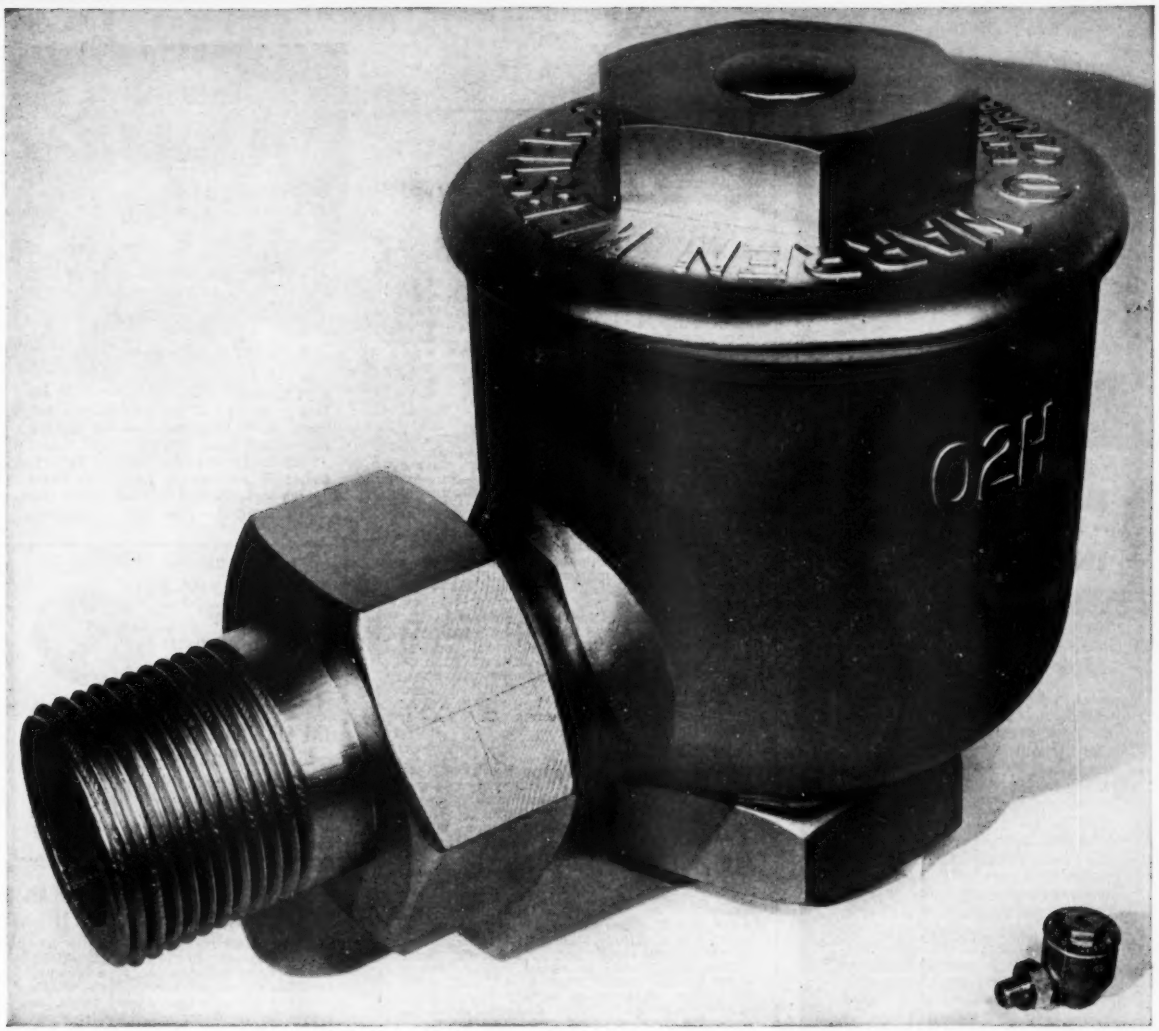

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If you need complete data on Webster Steam Heating and Process Steam Specialties, get this binder of bulletins. Write for your copy today. Ask for Bulletin C-536.

Long, trouble-free years of unfailing automatic performance . . . a service life as big as the giant model Webster Radiator Trap shown above. And low service costs throughout all those many years . . . costs as small as the actual Webster Trap illustrated at the lower right! These are the service extras built into every Webster Radiator Trap to give you consistent, dependable fuel conservation at low maintenance cost.

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Webster HEATING

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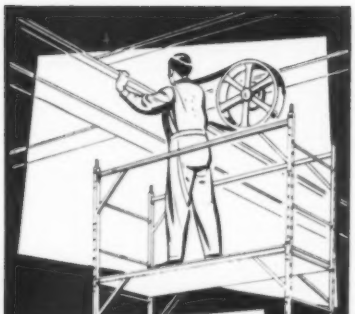

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Baker Adjustable Steel Scaffolds permit the placement of workmen at the correct distance from their work . . . no *unsafe reaching*. The fully adjustable platform height provides adjustment every 3 inches. Platform support trusses lock to upright ladder sections with both automatic and manual safety locks, making sure that they cannot be rocked or sprung loose. The platform is always level, even on uneven floor surfaces or stairways.

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The absence of "X" bracing permits the use of Baker Scaffolds in occupied areas with a minimum of disturbance . . . they span machinery, equipment and stockpiles.

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Please send me free information on Baker Scaffolds.

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CITY_____ STATE_____

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DATA FILE

(Begins on page 169)

25,000 to 200,000 Btu capacities. Gives construction features, dimensions; includes wiring diagrams. Warren Webster & Co.

MATERIALS HANDLING

273 Data on Tramrail Equipment—Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

274 Engineered Monorail Applications—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

275 Materials Handling Equipment—Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

276 Tubular Conveyors—Form HC-541 contains about 44-pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to advantage with them, and discusses benefits. Gives engineering data. Hapman Conveyors, Inc.

277 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

278 Conveyor and Elevator Belting Tips—This 32-pp manual on installation, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing and fastening are also covered, and there's a table listing common conveyor belt maintenance problems with their causes and remedies. The B. F. Goodrich Co.

279 For Overhead Handling—This 12-pp illustrated catalog covers motorized and hand operated cranes and monorails engineered for efficient, low-cost handling. Special construction features are detailed; accessory equipment shown. Abell-Howe Co.

280 Conveyor Belting—Twelve types of conveyor belting, for standard heavy duty and special applications, are described in this bulletin. Pictures the beltings in use, and discusses in detail some of the impregnations, coatings. Main Belting Co.

281 Overhead Cranes—This catalog describes underhung and top running overhead cranes in capacities to 10 tons and spans to 60 ft. Includes engineering data. Chicago Tramrail Corp.

282 Overhead Trolley Conveyors—Complete details on trolley conveyors and other types of power conveyors and conveying machinery are presented in this illustrated catalog. Mathews Conveyer Co.

283 Industrial Truck Reference Guide—Bulletin 300, 44 pp, covers company's line

Cost of wasted water @ $1.90 per M. cu. feet is $24.14.* If the leak is in a hot water faucet then fuel cost for heating this wasted water will be: $88.91 if coal (9,879 lbs.)†; $91.08 if oil (792 gals.)†. $84.41 if gas (84,411 cu. ft.)†. *These figures authenticated by Hackensack Water Co.* and American Gas Association†.*

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Anderson-Prichard Oil Corp.	Pabco Products, Inc.
Bethlehem Steel Company	Pittsburgh Coke & Chem. Co.
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	Uvalde Rock Asphalt Co.
	Wheeling Corrugating Co.
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Sweet's Catalog Service

Division of
F. W. Dodge Corporation
119 West 40th Street,
New York 18, N. Y.

For more facts circle 636 on Reply Card

DATA FILE

(Begins on page 169)

of current model tractors, trailers, fork lift trucks, platform lift trucks and load-carrying trucks. Major categories are: the trackless-train system; the fork-truck pallet system; and the lift truck-skid system. Each category is preceded by an analysis of applications and merits of the handling system. Mercury Mfg. Co.

284 How to Pick a Truck—Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks, and illustrate important construction and design features. The Baker-Raulang Co.

285 Industrial Logistics — Form A-9516-4490 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master load units, and transporting them as single units. The Elwell-Parker Electric Co.

286 Materials Handling System—Catalog 83 is a 12-pp booklet showing different units in company's Work-O-Matic system. On-the-job photos show material positioning with bin boxes and gravity-fed hoppers, and tiering, storing and dumping with multi-duty boxes and trays. Picture stories tell how end-loading scoops and multi-duty trays go further in integrating production, storage, material movement and disposal than previously thought possible. Union Metal Mfg. Co.

288 Portable Hoists — Description and specifications of more than 100 types and sizes of portable hoists appear in 8-pp Bulletin CL. They include ratchet lever hoists in roller and coil-chain models, with capacities from ¾ to 15 tons, standard and specialized spur gear hoists, Quik-Lift electric hoists. Coffing Hoist Co.

289 Sheet Lifters — Operational and design features of company's sheet lifting equipment which contributes toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp, Cullen-Friestedt Co.

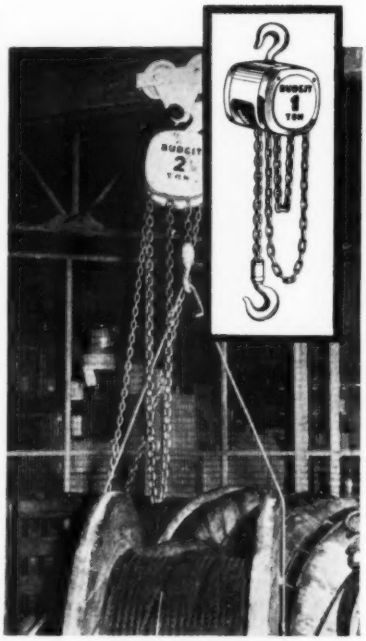
290 Industrial Lifts—This booklet presents a wide range of elevating equipment designed to step up efficiency and cut handling costs. Covers dock lifts, crossover bridges, sidewalk elevators, truck service lift. The Wayne Pump Co.

291 How to Operate a Crane — Booklet 920 is a 48-pp generously illustrated instruction book on crane operation, helpful to both beginner and seasoned operator. It shows hand signals, defines crane and hoist terminology. Covering all phases of crane operation, it discusses in detail the co-ordination of crane motions and includes safety rules and inspection, maintenance tips. Individual copies of this book are free to qualified plant engineers. The Electric Controller & Mfg. Co.

292 Electric Hoist Manual—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

293 Locomotive Cranes — Catalog 84, 16 pp, stresses advantages of the torque control unit used in company's cranes, and features illustrations of the mechanism and converter unit. Describes in detail the sealed, anti-friction bearings, air controls, brake, limit switch and other components. Orton Crane & Shovel Co.

294 Shovel and Loader—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating me-



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The ¼-ton 'Budgit' Aluminum Chain Block weighs only 29 lbs. It's a one-man hoist — easy to carry, hang up, and use anywhere. In maintenance, emergencies, on loading docks, in construction — wherever tough lifting must be done, the knock-about 'Budgit' is the tough hoist for the job.

The 'Budgit' Aluminum Chain Block is made in ¼, ½, 1 and 2-ton sizes. Whatever capacity you buy, you can be sure of carry-around lightness, enduring strength and all-around safety. And when it comes to ease of use, the 'Budgit' gives you spur-geared efficiency that — in the ¼-ton size, for example — lifts the full load with a pull of only 25 lbs. on the hand chain.

Your "Shaw-Box" Distributor will gladly give you details about the portable 'Budgit' Aluminum Chain Block. Or write for Bulletin 398.

'BUDGIT' I-BEAM TROLLEYS enable your hoist to travel the load as well as lift it. Ball-bearing equipped. Adjustable to fit several I-Beam sizes. Capacities 500 to 4,000 lbs. Priced from $15.50. Write for Bulletin 390.

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'Budgit' ®

CHAIN BLOCKS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial Instruments, and Aircraft Products.

A-676

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Lambert Pharmacal Company, Jersey City, N.J., where Listerine Products are manufactured. Ruud-Monel Sanimaster is used here 24 hours a day.

RUUD-MONEL two°temp Sanimaster

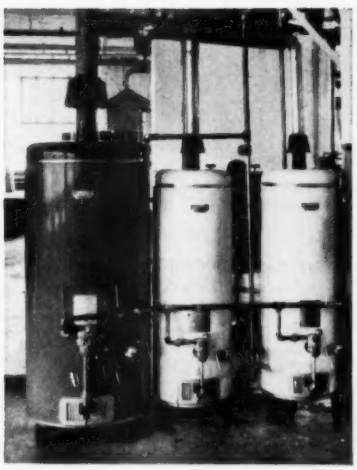
AUTOMATIC GAS WATER HEATER

Selected for processing Listerine products

RUST PROOF

180° SANITIZING HOT WATER

140° GENERAL USE HOT WATER



The highly specialized processing conducted in the Lambert Pharmacal Company Laboratories in Jersey City, N.J. requires rigid quality control. This includes processing at high temperatures, with absolute certainty of freedom from iron oxide contamination. The Ruud-Monel Sanimaster meets these special requirements.

MONEL—Nature's Wonder Metal—is the *only* metal that safely stores water at such a high temperature as 180°. MONEL also resists corrosion . . . is unaffected by many fluids that destroy ordinary metals . . . prevents contamination . . . and is completely rust-free.

Add up all these features and you can see why Sanimaster, the *only* water heater with a tank of solid MONEL, will give you years and years of safe, dependable service.

In addition to the Ruud-Monel two°temp Sanimaster, Ruud offers a complete line of water heaters for domestic, commercial and industrial applications.

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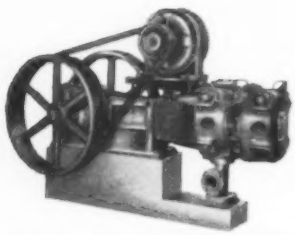
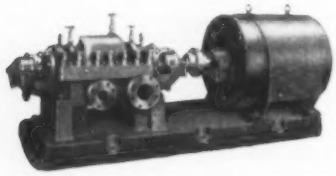


OILFREAIR & OILFREGAS Compressors Class ATL with steel-backed carbon cylinder-liners. Guaranteed to compress free of any trace of oil or oily vapors. Bulletin 600-10

AIRCHEK VALVE Automatically prevents reverse flow through Compressor and also dampens pipe line pulsations.

This Check Valve should be on EVERY reciprocating Compressor. Bulletin 509-10



PENNSYLVANIA 6-Stage Type OHB THRUSTFRE Pump for Boiler Feeding. Bulletin 242-10

YOUR Copy of Catalog 546 briefly describes All PENNSYLVANIA Products. Write For It Today.

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Pump & Compressor Co.
EASTON, PA.

OILFREAIR® OILFREGAS® THRUSTFRE® AIRCHEK®

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DATA FILE

(Begins on page 169)

chanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

295 Trolley Hoists—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

LUBRICANTS, LUBRICATION

296 Lubricant Data Book—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricants requirements of equipment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

297 Versatile Industrial Oil—Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equipment, and available in 15 viscosity grades. Discusses six major characteristics of the oil, explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors; hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.).

298 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

299 Multi-Purpose Grease—This bulletin describes Gargoyle Grease BRB No. 1, intended to provide correct lubrication for practically all normally loaded anti-friction and plain bearings. Tells how it resists leakage, protects against rust and corrosion. Socony-Vacuum Oil Co.

300 High Temp Lubrication—How "dag" colloidal graphite has been used successfully in various lubricating applications involving temperatures up to and over 2000 F is described in Bulletin 423. Acheson Colloids Co.

301 Force Feed Lubricators—Twelve-pp Catalog 25 G describes and pictures company's new Model 25 lubricator, a popular priced, general purpose unit adaptable to many applications. Lists machines for which it provides economical, automatic lubrication. Discusses drive arrangements. Manzel Div., Frontier Industries, Inc.

PUMPS, COMPRESSORS

302 Installing a Pump—Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

303 Pump Service Manual—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings and parts lists are provided, also high and low capacity steam consumption curves, general information on water, properties of steam. Warren Steam Pump Co., Inc.

304 Condensed Pump Data—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming

A WIDE RANGE OF ACCURATELY *REDUCED PRESSURES*

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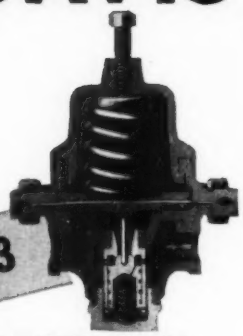

No. 13

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Here's positive, accurate pressure reduction in a range from 1 to 100 pounds. The Davis No. 13 is ideal for control of unit heaters, steam kettles, vulcanizers, presses, sterilizers and other small equipment. Tight closing . . . non-sticking feature assures long dependable operation and minimum maintenance, easy servicing. Built-in strainer for easy cleaning. Install Davis pressure regulators for least in maintenance, tops in dependability.

- ***BUILT-IN STRAINER*** **for easy cleaning, positive protection!**
- ***ORIFICE TYPE VALVE*** **for tight-closing, non-sticking operation.**
- ***BRONZE, SEMI-STEEL, OR STEEL BODY*****—special alloy trim available.**
- ***COMPLETE RANGE OF SIZES*****—⅜, ½, ¾, 1, 1¼, 1½ and 2 inches.**

SEND FOR NEW CATALOG No. 200—Features pressure regulators, altitude valves, pump governors, emergency valves and relief valves.

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DAVIS REGULATOR COMPANY

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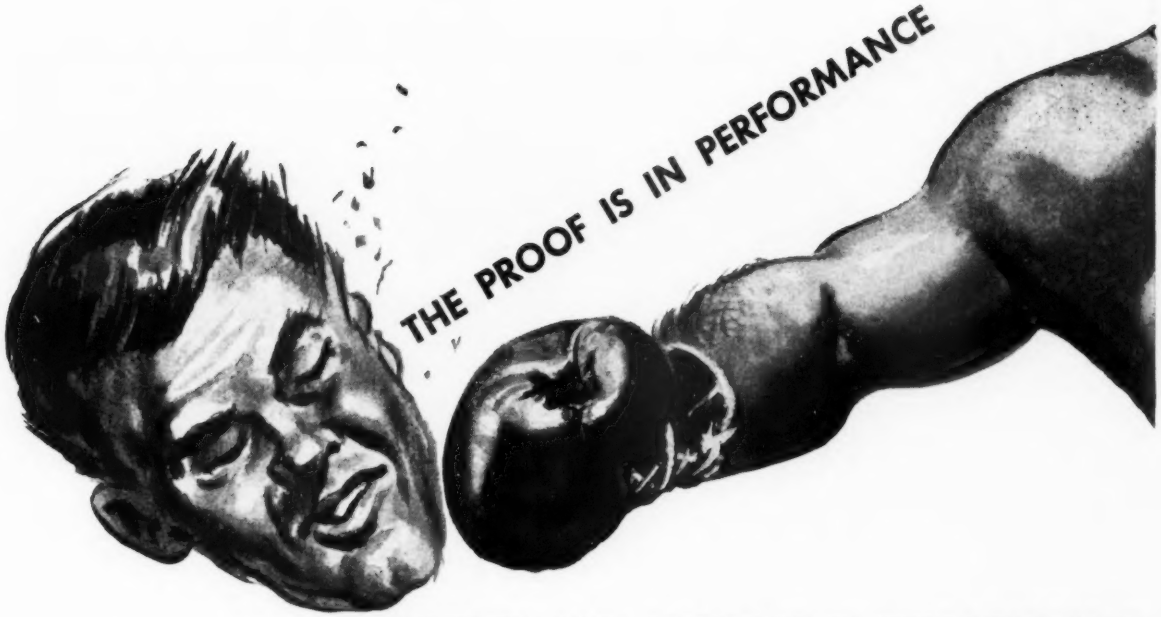

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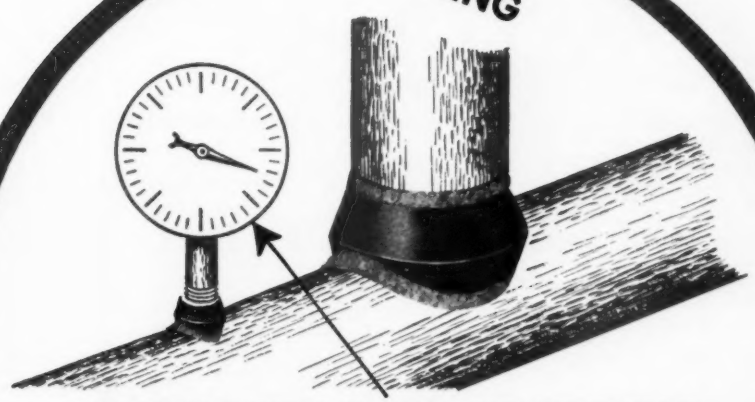

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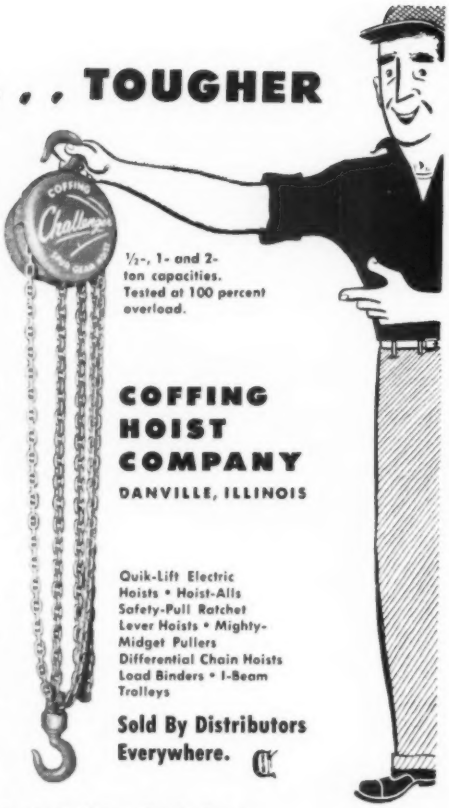

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Never before such easy portability and rugged, shock-resisting strength in a spur-gear hoist . . . never such simplicity of design and ease of servicing.

Light weight—carry it in one hand: set it up anywhere. One-ton model weighs only 39½ lbs.

All Steel—even the housing. Takes shock loads and impact as only steel can.

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Find out how this better spur-gear hoist can improve operations and save expense for you. Write for bulletin PE2C.

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DANVILLE, ILLINOIS

Quik-Lift Electric Hoists • Hoist-Alls Safety-Pull Ratchet Lever Hoists • Mighty-Midget Pullers Differential Chain Hoists Load Binders • I-Beam Trolleys

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Control Center

Modern way to control unit heaters

In this handsome, prewired cabinet, you house all necessary controls for a unit heater—thermostat, disconnect switch with overload protection, summer-winter switch, pilot light, and terminal block. All field wiring leads to the numbered terminal strip. You reduce installation costs substantially. You get more, for less.

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. . . for surface mounting. Adapter ring for flush mounting optional. Cabinet finished in attractive hammered gray.

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For Bulletin No. T-1 . . . gives you complete data plus typical wiring diagrams.

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DATA FILE

(Begins on page 169)

units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

305 Data on Pumps—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

306 "A Turn for the Better"—Bulletin 30-B, 8 pp, discusses manufacturer's improved Moyno pump, explaining in detail its progressing cavity feature and showing how the rotary motion created provides continuous flow at positive pressure. Stresses performance advantages of the pump. Pump Div., Robbins & Myers, Inc.

307 Compressors, Pumps—Catalog 546, 6 pp, presents company's line of air and gas compressors, Oilfreair and Oilfregas compressors, dry vacuum pumps, aftercoolers, Airchek valves, and centrifugal pumps for boiler feeding and general applications. Pennsylvania Pump and Compressor Co.

308 Air Compressor Selection Data—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's Y and G air compressors. The Y line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described, dimensions and ratings given. Westinghouse Air Brake Co.

309 Centrifugal Compressors—Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

PACKINGS AND GASKETS

310 Packings and Gaskets—In this 40-pp belting and packing manual (NY-2697-P) are helpful charts plus information on the care, use and maintenance of rod and sheet packings and gaskets. A complete engineering section contains all necessary charts and tables for determining working specifications of packings. Also included air packing recommendation charts. New York Belting and Packing Co.

312 Buyer's Guide on Packings—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons on inside-packed piston pumps. Greene, Tweed & Co.

MAINTENANCE AND CONSTRUCTION

313 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

314 Tar Base Coatings—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintenance purposes; a coating for protection against generally severe corro-

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The Packing Palmer Picked

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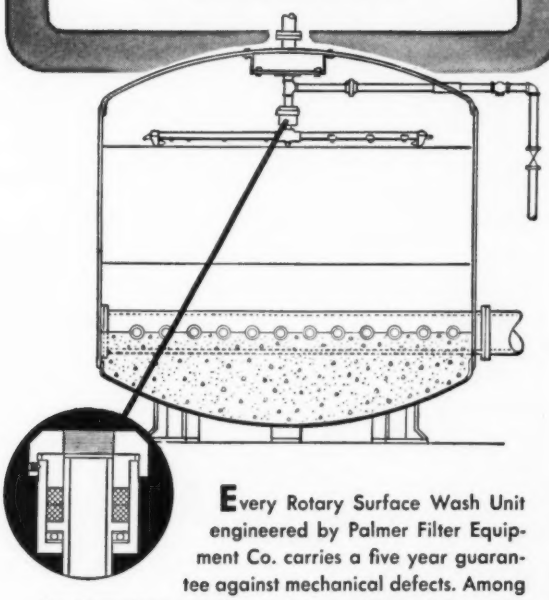

Every Rotary Surface Wash Unit engineered by Palmer Filter Equipment Co. carries a five year guarantee against mechanical defects. Among the champions called upon to save Palmer from costly field service trips is Palmetto Palco Self-Lubricating Packing. Here are the facts as stated by Palmer's design chief:

"The performance of Palco Packings in thousands of Palmer Rotary Surface Wash Unit Bearings has been outstanding. These units are installed in open gravity and pressure filters handling both hot and cold water and certain types of chemical solutions. Conditions involve extreme temperature ranges with no possibility of lubrication since this would contaminate process liquids. Palmetto Palco has been used exclusively for 14 years with no replacements required due to packing failure even in the original units; it has helped us maintain our five year guarantee with minimum time and expense."

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GREENE, TWEED & CO. North Wales, Pa.

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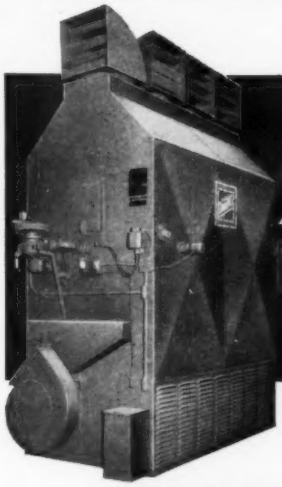

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400,000 to 2,000,000 Btu/hr output
For large commercial and industrial buildings

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For stores, service stations and other small buildings

ALL DRAVO HEATERS have automatic temperature control and a minimum efficiency of 80%... require no ductwork ... are ideal for heating in the winter, ventilation in the summer and for process drying.

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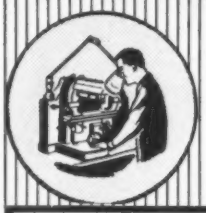

- WILL NOT WORK LOOSE OR DROP DOWN—BECAUSE OF LOCKED-IN SPRING-TENSION.
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Here is a new incandescent metal shade engineered to remain comfortable to the touch even after long hours of use with 100-watt lamp.

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For more facts circle 646 on Reply Card

DATA FILE

(Begins on page 169)

sive conditions; and one for water tank interiors. Pittsburgh Coke & Chemical Co.

315 One-Coat Insulation — This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Tells how to apply. Insul-Mastic Corp. of America.

316 Guide to Rust Prevention—The 24-pp 1954 edition of this company's general catalog provides a treatise on rust prevention. Features 94 color chips of manufacturer's products and includes instructions for surface preparation and application of primers, short- and long-oil types, machinery and implement finishes, chemical and heat resistant types, sealers, oil field finishes, thinning oils and floor and masonry coatings. Presents a restful color group of finishes for plant interiors; also describes special finishes. Rust-Oleum Corp.

317 Painting with Aluminum — Again made available to plant engineers is Form AD-228, 32 pp, on the use of aluminum paint. Discusses advantages of aluminum paints, describes three basic types: for non-absorbent surfaces, for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture and practical suggestions for good results included. Use of aluminum paint on steel, galvanized metal, wood, masonry and other surfaces is detailed. Aluminum Co. of America.

318 Coatings for Chemical Industry — Advantages and use of synthetic resin-base coatings in the chemical industry are described in this 8-pp brochure. Presents 16 industrial case histories. Specific applications of coatings based on Bakelite and

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AEROTEC Integral Collectors remove industrial dusts that cause excessive wear of machinery and equipment in your plant, save you money by reducing your maintenance costs and safeguard your employees' health!

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In vapor systems where pressure relief to atmosphere is a must for safety—maximum savings important, Cochrane Multiport Pressure Relief Valves are the answer.

Safer—multiple "vapor cushioned" valve discs instead of one ordinary valve disc insure discharge upon overpressure without freezing, sticking or jamming.

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Easily adjusted to desired pressure—simply turning the valve handwheel or chainwheel obtains any desired pressure setting in the range zero to maximum. You are able to change quickly to any new back pressure you desire to carry.

Simple, positive operation—when pressure rises above set pressure the vapor cushioned valve discs e-a-s-e open metering off only unusable vapor, then close gently. Abrupt changes are eliminated, equipment always protected.

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job-rated

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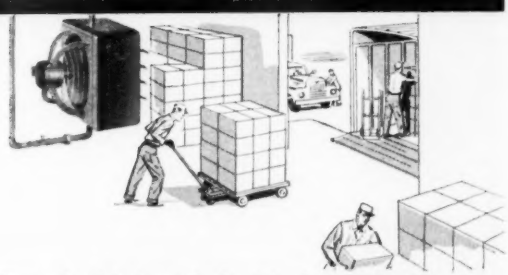
UNIT HEATERS

BEAUTIFUL ENOUGH FOR THE LOBBY

POWERFUL ENOUGH FOR THE LOADING DOCK



Choose the right heater in the right size from the *job-rated* line of Herman Nelson Horizontal Unit Heaters. Eighteen sizes handle every heating need, all are designed to use either steam or hot water. You get quick heat—no warm up to waste fuel and electric current. Get the best—and most beautiful—get Herman Nelson Unit Heaters. Available also in Vertical, De Luxe, Gas Fired and Industrial models.

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AMERICAN AIR FILTER OF CANADA, LTD.
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For more facts circle 648 on Reply Card

DATA FILE

(Begins on page 169)

Vinylite resins described include tank cars, oil pipe, acid tanks, sewage disposal plant, shipping containers, plating rack and steel tubing. Also included is tabulation of effects of various chemicals on vinyl resin-base coatings. Bakelite Co., Div., Union Carbide and Carbon Corp.

319 For the Overhead Jobs — Scaffolds designed to make overhead work safer and easier are described in 16-pp Form 10-852. Illustrates and discusses adjustability, large working platform, easy assembly, self-locking trusses and other advantages. Shows how they are readily stacked for height. Baker-Roos, Inc.

320 Vacuum of Many Jobs—Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

321 Building Maintenance—Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

322 Proper Care of Floors—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, wood, tile, linoleum, mastic wood. West Disinfecting Co.

323 Floor Scarifier — Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation; is one-man operated. G. H. Tennant Co.

324 Blower-Suction Cleaner — Data on a portable combination blower-suction cleaner for cleaning machinery, motors, stock bins is offered. Describes models available, attachments for a wide range of cleaning jobs. Clements Mfg. Co.

325 Translucent Structural Panels—Bulletin 533, 12 pp, describes Resolite, a translucent structural material, corrugated or flat, molded of thermosetting polyester resins reinforced with woven glass fibers. Illustrates use of Resolite in partitioning, skylighting and decorating installations. Provides standard sheet specifications, general information on colors, weights, light transmission and thicknesses. Resolite Corp.

326 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, sizes, allowable loads. Alan Wood Steel Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

327 Pipe Tool Book — This catalog and data book gives information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

328 Hydraulic Pullers—Industrial maintenance problems involving removal and installation of gears, bearings, pulleys, sheaves, pinions, shafts, couplings, and tubes are treated in Power-Twin Bulletin HY-1953, 24 pp. Covers use and application of pullers, attachments and adaptors for 17½-, 30- and 50-t hydraulic rams. Also shows puller sets for use with company's center-hole rams. Owatonna Tool Co.

329 Tools for Mechanics—Catalog U is a 106-pp ordering book covering a wide range of power and hand tools for production, maintenance and service work. Describes, pictures and gives application tips and sizes on wrenches of all types, pullers, drills, sanders, polishers, grinders, reamers, taps and dies, testing tools, soldering irons, tool sets, benches and cabinets. Includes price list. Snap-on Tools Corp.

330 Machine Tools, Their Lubrication — A history of machine tools, an explanation of their mechanical aspects and an analysis of the role of lubricants in their maintenance and operation are contained in this 80-pp booklet. Not a manual on tool lubrication, this book is a comprehensive discussion of fundamental factors in the construction, operation and maintenance of modern machine tools. Shows how power is controlled and force directed to shape metal by cutting and chipping; analyses factors that contribute to friction and wear; and describes role of lubricants. Shell Oil Co.

331 Improved Cutting Oils—Cutting oils for keeping parts and tools up to 50 deg cooler and representing a new concept in non-emulsifying oils are described in two new technical bulletins. Form A-2724 describes Sunicut 11-S and 209-S, non-staining dual-purpose oils primarily for medium duty to heavy duty operation on automatic screw machines. Form A-2723 covers Sunicut 102-S and 110-S, which contain active-type sulfur and are effective for heavy-duty operations. Sun Oil Co.

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WITH THE CENTER-HOLE OTC 50 TON HYDRAULIC PULLER

New 50 Ton CENTER-HOLE Hydraulic Puller

Removes or installs bearings, gears, pinions, shafts, studs, wheels, pulleys, etc. — 75% faster and 90% easier without damage or distortion. This new OTC 50 ton ram is completely portable (weighs only 45 lbs.) — has remote control pump — interchangeable ram heads — and can be used as a production holding fixture. Also available in 17½ and 30 ton sizes.

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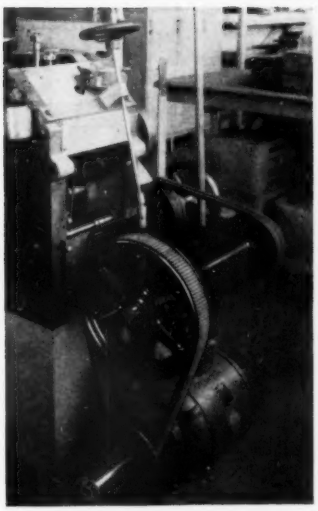

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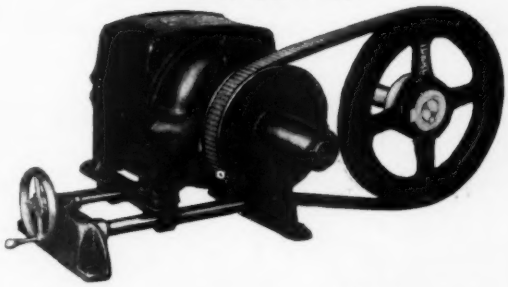
Variable Speed

PULLEYS



Quickly, easily installed on old or new machines . . . allowing infinitely variable speed adjustments over wide range. A mere turn of hand instantly, accurately speeds up or slows down the driven unit for *changes in production schedules . . . adjustment for operator ability . . . corrections for size or stock, temperature or humidity, size or density.*

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Available in 8 sizes — fractional to 8 hp. with ratios to 3 to 1.

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INSTANTANEOUS HOT WATER HEATERS

In Daily Use in These Plants
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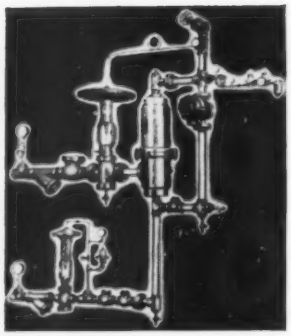

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Fuel Savings Are Substantial. Steam injection heating is the most efficient method known. There's no waste because water is heated only as used . . . never stored and allowed to cool.
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Installation Is Inexpensive. Only ordinary pipe connections are required.

WRITE DEPT. PE-154
Write for booklet on how Pick Heaters cut costs of hot water. No Obligation.

PICK MANUFACTURING CO.
WEST BEND, WISCONSIN

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DATA FILE

(Begins on page 169)

BOILERS, GENERATORS

332 Packaged Boilers—This 16-pp illustrated catalog describes manufacturer's new Type VP package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 30,000 lb per hour. Space requirements are shown in a table. Combustion Engineering, Inc.

333 Shop-Assembled Boiler—Sixteen-pp Bulletin G-76, completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. Capacities, dimensions given. The Babcock & Wilcox Co.

SAFETY AND SANITATION

334 Advice on Washrooms—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions included. Scott Paper Co.

335 Dry Chemical Extinguishers—New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

336 Hand Dryer—Form 1123 describes and pictures a high-speed hand and face dryer for use in industrial washrooms. Tells special features. The Chicago Hardware Foundry Co.

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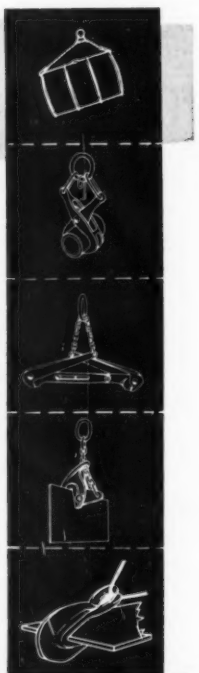

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Yes we said anything—odd shapes, round, oblong, square or even loose objects such as bags or bundles. Best of all you save money on your handling problems while protecting employees.

Downs Safety Grabs are engineered to provide a load safety factor greater than rated capacity plus a Bulldog grip that won't let go until you release the load. There's a Downs hook, grip, tong or sling to fit every handling problem. Write for free illustrated catalog 200 today!

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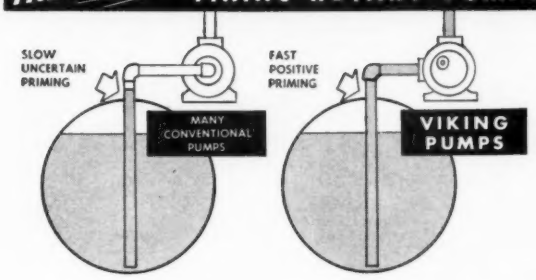
FAST STARTS WITH VIKING ROTARY PUMPS



It's the fast start and smooth, even flow that gets your pumping job done quicker and at less cost.

No slow, uncertain priming with Viking positive suction pumps. They prime themselves and go to work at once.

They also save on wear of valves and meters. No sudden jar and spasmodic delivery.

VIKING AN HONORED NAME IN PUMPING

Investigate the smooth, even flow of Vikings today. To start, ask for bulletin 545Z.

See Our Catalog in Sweet's

VIKING PUMP COMPANY
CEDAR FALLS, IOWA

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● Beaver machines are made with lathe-like precision, yet are as rugged as power shovels. They can be depended upon to "deliver the goods" job after job . . . no costly downtime for repairs or adjustments. When you buy a Beaver, you're assured of a quality product, manufactured by an experienced company. That's why we say . . . "Buy a Beaver and forget about it!"

Check these amazing BEAVER Features! The BEAVER Model "A" Pipe and Bolt Machine

•Right-handed operation. • All controls in front. • Chuck to the left, tool mounting to the right. • All gears run in oil. • Inverted chip-free rack-and-pinion feed. • 12-inch working space. • Heavy-duty 1/8 to 2-inch chuck. • Ring-type adjustable quick-opening die heads—no hinge to get fouled with chips. • Power to thread up to 12-inch pipe. • 200 different kinds and sizes of dies available!

WRITE FOR YOUR BEAVER QUICK-REFERENCE CATALOG NOW!

BEAVER PIPE TOOLS
210-300 Dana Ave., Warren O., U.S.A.
"33 Years of Highest Quality"

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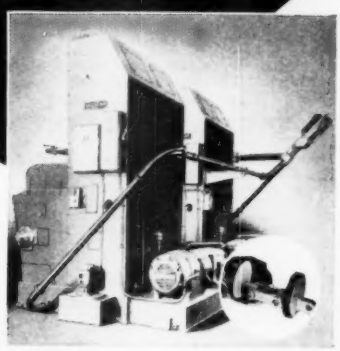
HERE'S HELP!

Hapman CONVEYORS offer TWO WAYS to REMOVE CHIPS AUTOMATICALLY



TUBULAR CONVEYOR HANDLES SMALL CHIPS

. . . from machine tools like these Oilgear Vertical Broaching Machines, using one Hapman Conveyor with *patented* Sealed-pin Chain and tough Neoprene Flights. Tubular Conveyor will also handle abrasive dusts, scale, sludges, welding flux.

Chip-O-Matic TYPE REMOVES SPIRAL TURNINGS

. . . large chips, small parts, stampings and scrap automatically. Simple and dependable in design, this money-saving conveyor can be adapted to remove parts from coolant tanks *without* loss of coolant. Also has Sealed-pin Chain and Rib Flights with Neoprene wear strips.

GET DETAILS ON BOTH COST-CUTTING TYPES — WRITE FOR:
Tubular Conveyor Bulletin PE-254
Chip-O-Matic Bulletin C PE-254

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN

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DATA FILE

(Begins on page 169)

WATER TREATING

337 Boiler Scale—Formation and Prevention—Technical Paper 98 is a 12-pp article covering the cause and prevention of boiler scale. Covers the mechanism of scale formation, effect of boiler scale, chemistry of scale formation, internal chemical treatment, correctives. W. H. & L. D. Betz.

339 Solids Contact Reactor—Bulletin 5001-A, 24 pp, discusses a solids contact reactor for clarifying and/or lime softening of water. Explains advantages of this principal, including its catalytic effect, accelerated reactions and larger precipitates, cutting down of detention time, and saving of chemicals. Illustrates basic reactor types available. Cochrane Corp.

340 For Conductometric Determination of Solids—A quick and simple method for determining solids contents of boiler water or condensate is explained and illustrated in Bulletin TRE50. Hall Laboratories, Inc.

OTHER EQUIPMENT

341 Plumbing, Heating Supplies—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated, gives sizes, intended uses and necessary ordering information. J. A. Sexauer Mfg. Co., Inc.

342 Hose and Tubing—Catalog CC-400 is a 16-pp illustrated quick-reference booklet on manufacturer's flexible metal hose and tubing. These products are made in two basic types: seamless and strip wound. Catalog shows wide range of available alloys and sizes, suggested uses; gives engineering data. The American Brass Co.

344 Steel Reservoirs, Standpipes — This 24-pp booklet pictures installations of reservoirs of 50,000- to 10,000,000-gal capacity, having cone, umbrella or ellipsoidal roofs and ornamental structures with special architectural features. Provides table of standard capacities, information on foundations, data on use of suction tanks for fire protection. Chicago Bridge & Iron Co.

345 Magnetic Selection Guide—Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lighting magnets, serves as handy guide to the selection of magnets. Dings Magnetic Separator Co.

346 Finishing Systems—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamel, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors and fog filters. The R. C. Mahon Co.

347 Production Control System, Procedures—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production lines. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

348 Brushes on the Job—This interesting booklet, about 40 pp, presents 20 illustrated case histories showing how typical problems are being solved by brushes. These cover cleaning radiator sections, deburring aluminum pieces, washing potatoes, removing scale from pre-heated bar stock, finishing stainless steel sheets, removing sand from hot cast iron and many other jobs. Pittsburgh Plate Glass Co.

349 High Pressure Cylinders — Catalog 233A, 32 pp, covers cylinders for hydraulic operation, for working pressures to 1500 lb. Fifteen models are presented along with dimensions, capacity data, design details. Book also provides information on clevises and mounting brackets, air cylinders and valves. Includes alignment chart. Hanna Engineering Works.

350 Industrial Leathers — These illustrated data sheets cover company's leather products and include specifications on various types of leather belting. Also gives data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

351 Handbook on Fluid Circuits — Now available to plant engineers is the second printing of "The Circuit Rider." This 32-pp pocket-size manual presents a down-to-earth discussion, together with drawings, of basic designs in fluid power circuits and points out the wide range of operations possible through the application of different types of such circuits. The Logansport Machine Co., Inc.

352 Hydraulic Hose Selector—The Wire-tex rubber covered hydraulic hose selector is offered to users of hydraulic control hose. Starting with any known factor—the ID, OD, minimum burst working pressure required, etc.—a plant engineer can use the selector to determine the proper hose for the job. Republic Rubber Div., Lee Rubber & Tire Corp.

353 Socket Head Fasteners—Advantages of company's screw products are described in this folder. Included are socket head cap screws, shoulder screws, flat head socket cap screws and button head socket screws. Also described are socket screw keys, square head set screws, pressure plug and dowel pin. Standard Pressed Steel Co.

354 Air Cylinders—Bulletin A-105G uses only 8 pp to present complete engineering, design, construction and mounting data (including all mounting drawings) and dimension tables covering 13 mounting styles in 1½ through 14 in. bores. It's designed for easy selection of proper model. Covers cushioned and non-cushioned cylinders, single and double acting, single and double rod end, spring return and over-sized rod cylinders. Miller Motor Co.

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CONCRETE FLOOR PATCH

TEST IT ON TRIAL OFFER

TOUGH AS NAILS! FAST!

Repair broken factory floors without the usual traffic tie-up. Simply shovel INSTANT-USE into hole or rut — tamp smooth — truck over! No waiting! INSTANT-USE bonds tight to old concrete — right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

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Please send me complete INSTANT-USE information, details of TRIAL ORDER PLAN and HAND BOOK OF BUILDING MAINTENANCE—no obligation. (Clip and attach Coupon to Co. letterhead.)

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Company .....
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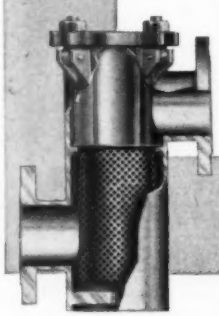
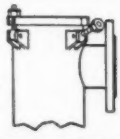


S-Type ADSCO Strainers screen out foreign matter from oil, water, and other liquid lines. Damage to valuable equipment is prevented. Usually installed on suction side but can also be used for discharge or other services.

S-TYPE

STYLE B COVER



Toggle and Bolt Type

Cover held in place by toggle bolts. This design simplifies removal of cover while cleaning basket screen. In sizes from 4" to 12", for pressures to 50 psi.

STRAINERS

AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK
Since 1877

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IT BLOWS • SUCTION CLEANS • SPRAYS

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PORTABLE ELECTRIC

COMBINATION BLOWER-SUCTION CLEANER

MADE IN 5 MODELS ILLUSTRATED: 1 H.P.

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That's a big order, but the super-efficient CLEMENTS-CADILLAC cleaning tool can do it for you—has done it for industry, business and institutions everywhere . . . for more than 40 years.

Just ask your mill supply dealer, or write us for proof. No obligation on your part.

"Most Useful Tool in the Plant"

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USED BY BUSINESS AND INDUSTRY FOR MORE THAN 44 YEARS

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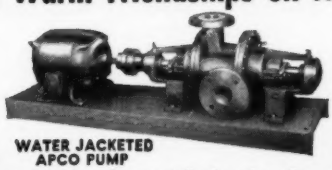

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Developed especially for the efficient handling of high temperature and highly volatile liquids. Delivers outstanding performance. Unbeatable on high head, small capacity duties.

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For Every Purpose

APCO Turbine-Type PUMPS

—ideal for "1001" duties where small capacities and high heads predominate. Get acquainted.

AURORA CENTRIFUGAL PUMPS

are available in many types and sizes—all noted for their streamline coordination between impellers and shells.

We Invite Your Special Pump Problems

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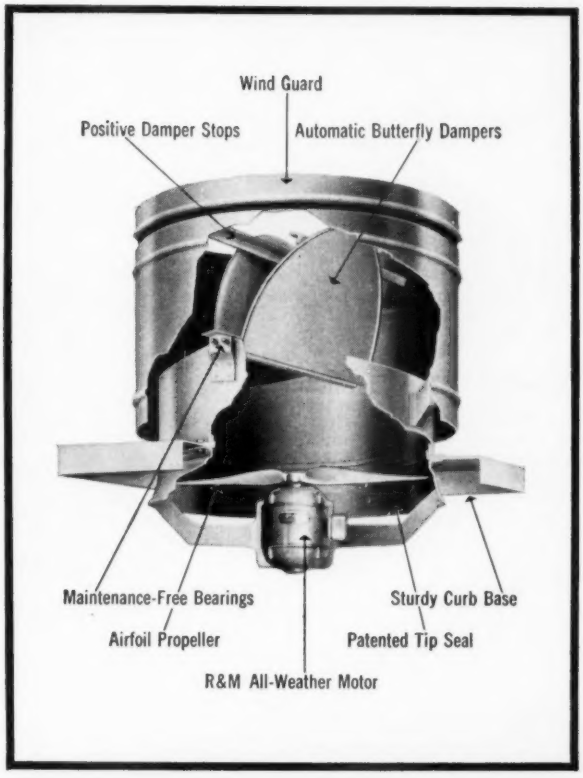
The Modern Power Roof Ventilator



Most economical way to expel heat, fumes, smoke

This modern power roof ventilator is backed by 20 years of research and engineering.

Famed airfoil propeller, powered by the *All-Weather* Robbins & Myers motor, sweeps up heat, moisture, dust, fumes—then *blasts them high into the outside air.* Wind guard and throat design assure constant performance regardless of wind.

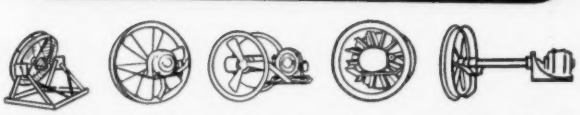
Automatic butterfly dampers open wide on minimum fan pressure for guide vane effect and virtually unrestricted air flow. Galvanized roof over damper shaft and bearing supports provides rainshed when fan is not operating. Easily mounted on any type roof, Sky-Blast provides air deliveries up to 78,800 CFM. Low silhouette cuts down roof stresses. Our engineers will be glad to give you free advice on any ventilating problem.

Write for Catalog 680-P.

PROPELLAIR®

DIVISION OF ROBBINS & MYERS, INC.

SPRINGFIELD · OHIO



Man Cooler Direct Drive Tubeaxial Vaneaxial Extended Shaft

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'ROUND ABOUT

(Continued from page 4)

discuss: Ventilation Practices—Then and Now; Air Flow Measuring Instruments; Inside the Industrial Ventilation Manual and Engineering a High-Velocity Duct System.

On Tuesday, sandwiched between the classes, will be talks on Sampling and Air Contaminants and Design and Application of Dust Collection Equipment. Wednesday will wind up the conference with discussions on Effect of Fan Connections on Performance; A Survey of Industrial Ventilation Practices.

On Thursday there will be a talk on Comfort Ventilation and Make-Up Air, and a discussion of controls.

More information about this conference may be had by writing to Third Annual Industrial Ventilation Conference, Continuing Education Service, Michigan State College, East Lansing, Michigan.

Standard Insulation Thickness

Producers of 85 per cent Magnesia and diatomaceous silica insulations have adopted new simplified thicknesses for pipe insulation which will aid specification writing and permit the use of all sizes and thicknesses in double layer construction.

While this is in effect a "standardization" procedure, it does away with the old so-called "Standard" and "Double Standard" thickness terminology which had been in use for many years.

The nominal thicknesses will start with 1 in. and step up by ½ in. increments. Actual thicknesses will depart slightly from the nominal thicknesses to facilitate double layer construction.

A complete conversion table covering all insulation thicknesses for all pipe sizes can be obtained from The Magnesia Insulation Manufacturers Association, 1317 F. Street, N.W., Washington 4, D. C.

Industrial Packaging Experts Discuss "Cushioning in Packing"

More than 250 industrial and commercial packaging experts attended a two-day Joint Industry Conference on "Cushioning in Packing," held at the Rackham Memorial Building in Detroit on December 7 and 8.

Sponsored jointly by the Materials Management Center of Wayne University and the General Motors Corp. Preservation-Packing Committee, the program included 24 technical papers.

Great interest was shown by the conferees in the first day's sessions which demonstrated that cushioning means and methods can be engineered by analytical methods and their effectiveness proven by various testing methods.

A limited number of copies of the bound volumes of the technical papers presented at this conference are available from the Wayne University Materials Management Center, 5402 Second Boulevard, Detroit 2, Michigan, at a price of $2.00 each.

View of panel discussion which discussed cushioning principles, techniques and test methods. In all, 24 technical papers were presented at this conference

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Move Loads Between Levels

with a SERVICE ELECTRAULIC LIFTER

Service "Four-Poster" Lifter eliminates long, space-wasting ramps and takes strain off men and mobile equipment in moving loads between floor levels. Used as a dock hoist, it speeds up loading and unloading of trucks and boxcars. Operates smoothly from an electric-hydraulic power unit designed for continuous operation. No pit is required—it's easy to install indoors or out. Lifters are available with capacities to 12,000 lbs., platform sizes 5 to 12 ft. and for lifts 5 to 17 ft. Both portable and permanently-installed units. For more detailed information, write today, for Bulletin 51.

See SERVICE for "Specials"

Versatile design of Service's wide range of Lifters, Levelers and Liftables permits them to be made up as semi-specials to fit your exact needs. We'll be glad to help you with your lifting problems.

Keep MoTowLift in Mind!

It's the fork lift truck so good that military needs take all we can make. Soon, we hope, you will be able to buy it again—the best truck for most jobs in most plants. Keep MoTowLift in mind.

INDOOR MILES Made EASIER and SAFER

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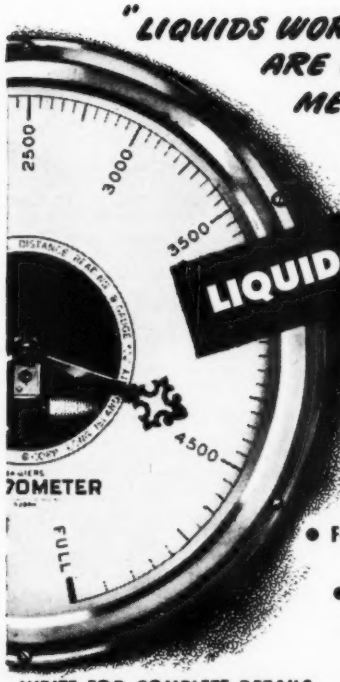

LIQUIDOMETER Tank Gauge

- FOR GAUGING LIQUIDS OF ALL KINDS
- 100% AUTOMATIC
- APPROVED BY UNDERWRITERS' LABORATORIES

WRITE FOR COMPLETE DETAILS

THE LIQUIDOMETER CORP.
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Save Time
Cut Costs

If you have your own switch track, you can profitably use an S-A Car Puller. No need to use a gang of men or wait for a switch engine. *One man can shift or spot up to six loaded cars under normal conditions.* Powerful capstan will also pull or lift other heavy loads at 45 feet per minute. *Mail coupon for Bulletin 1339.*

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HEAT UP STEAM UNITS in 1/8 the TIME with HEAT-KWIK Super-Silvertop STEAM TRAPS

Interested in getting more production out of your steam-consuming units? Then equip them with the new Heat-Kwik Super-Silvertop Steam Traps. One of the most important steam trap developments in our times, Heat-Kwiks heat up units in 1/8th the time of ordinary inverted bucket traps . . . three times as fast as so-called air eliminator or blast type traps. Everywhere users are adopting these phenomenal traps as the answer to fast heating up, more production, and lower steam consumption. You, too, can save money by standardizing on Heat-Kwiks. See your Super-Silvertop distributor or mail coupon for further information.

SUPER-SILVERTOPS
Quality Steam Traps since 1886

THE V. D. ANDERSON COMPANY
1939 West 96th Street • Cleveland 2, Ohio
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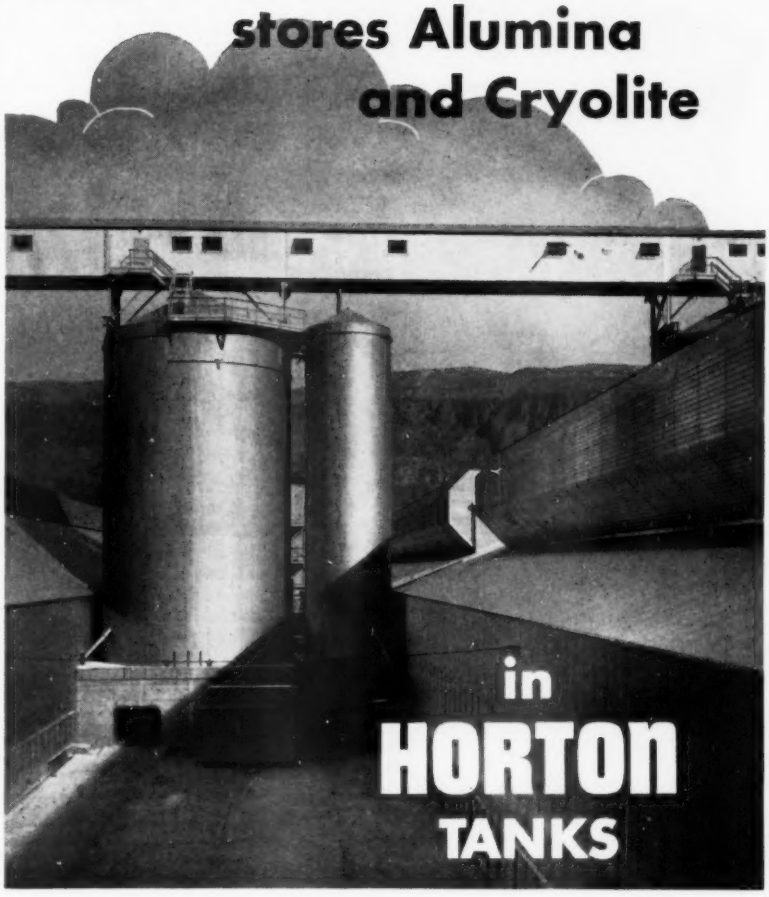

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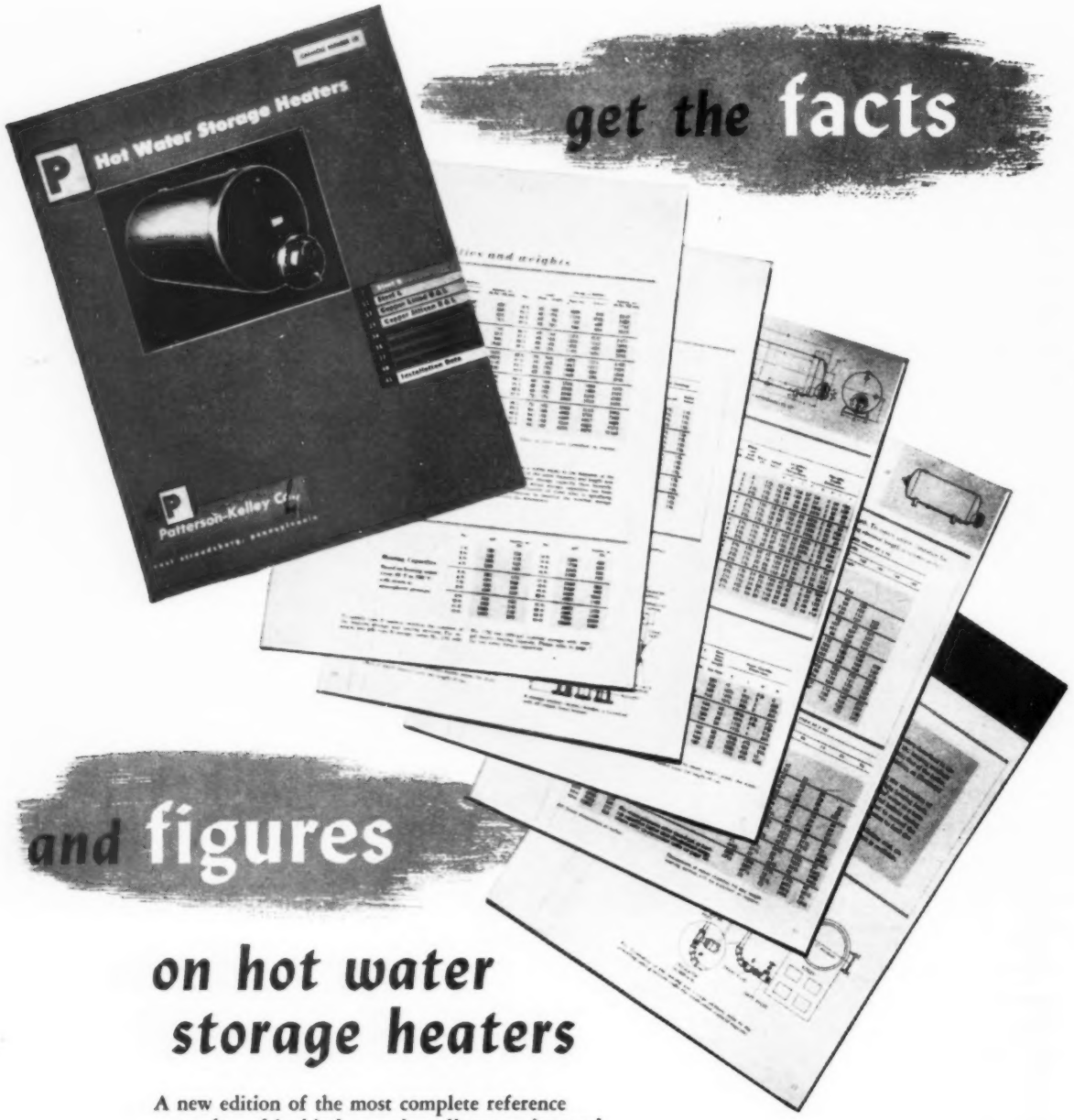

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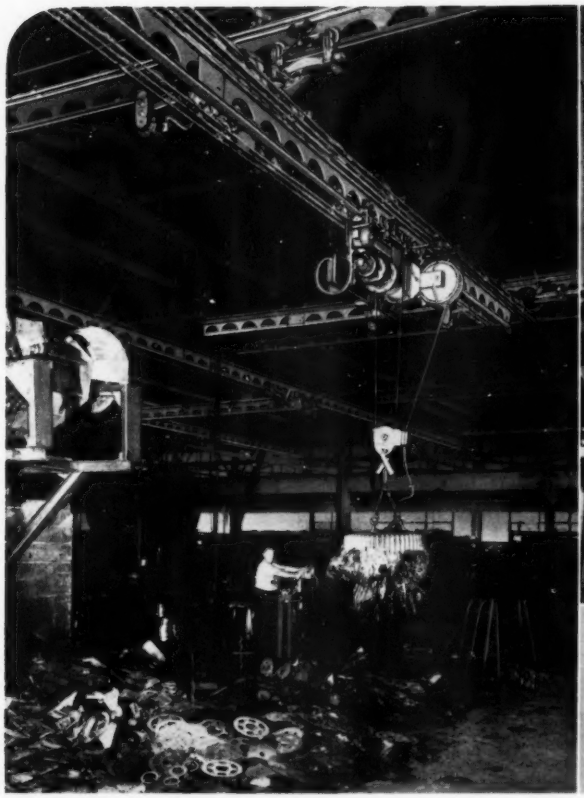

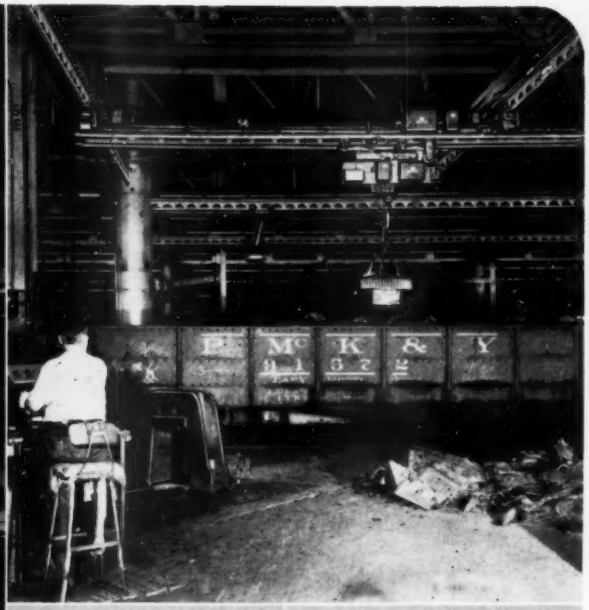

Baled scrap is handled directly from baler to railroad car by the same crane.

Scrap from slat conveyor is dumped on floor at left. Crane with magnet then takes it to baling machine next to operator who operates all controls — crane, magnet, baler — from this one point.

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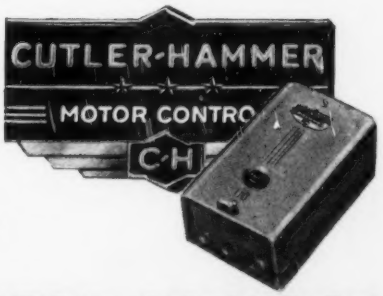

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